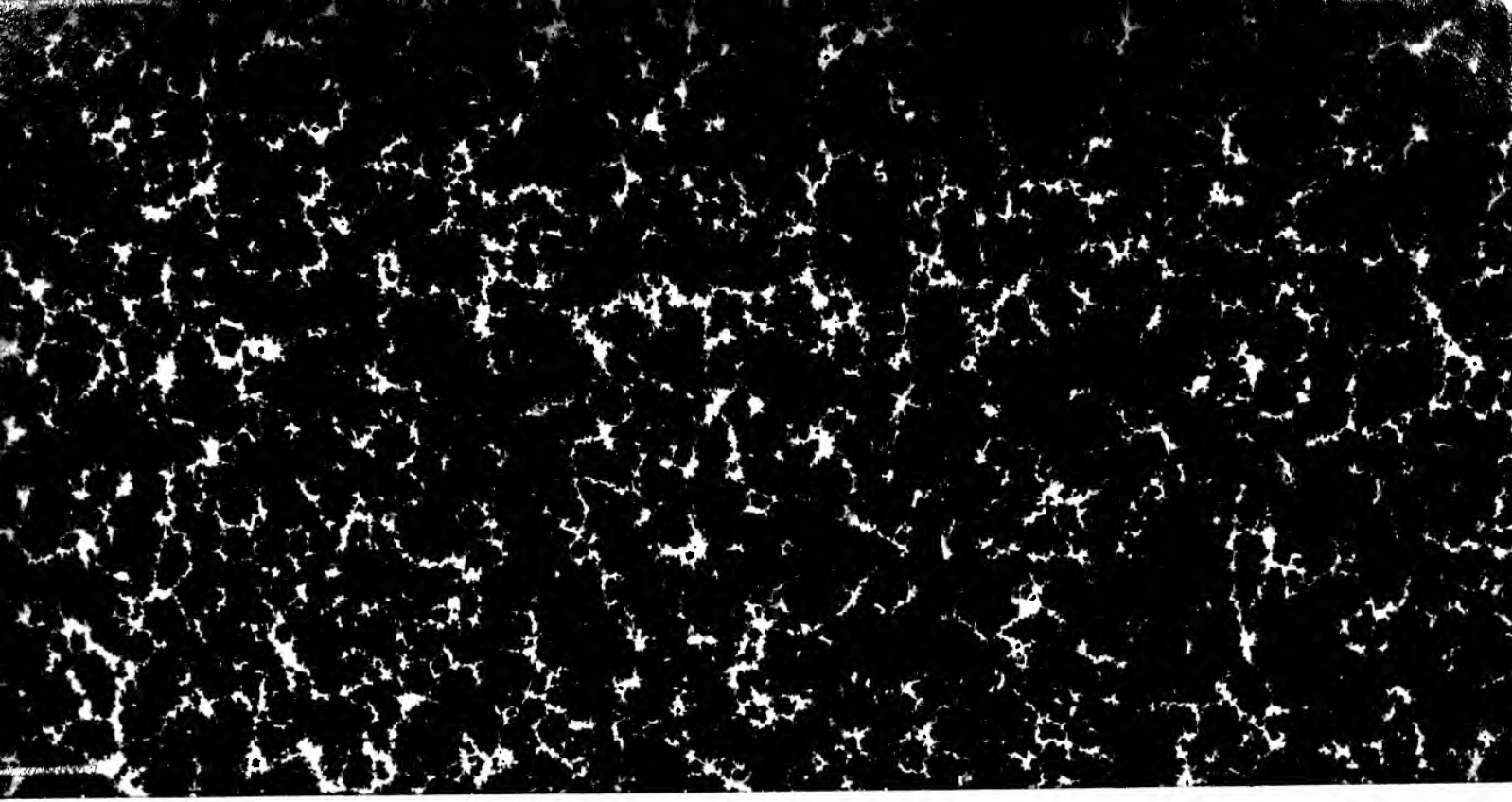


THE

SCOTTISH NATURALIST:

A Magazine of Natural History.

EDITED BY

F. BUCHANAN WHITE, M.D., F.L.S.

VOLUME IV.

"Great Nature, ever young, yet full of eld;
Still mooving, yet unmoved from her sted;
Unseene of any, yet of all beheld."

—*The Faerie Queen.*

WILLIAM BLACKWOOD AND SONS.
EDINBURGH AND LONDON.

1877-1878.

INDEX.

	PAGE
GENERAL INDEX . .	iii
SPECIES SPECIALLY NOTICED—	
ANIMALS—	
Mammals . .	vi
Birds . . .	vi
Insects, &c. . .	vi
PLANTS—	
Flowering . .	vii
Cryptogamic . .	vii
Galled . . .	vii
FAMILIES INCLUDED IN INSECTA SCOTICA . .	viii
NEW SPECIES—	
Animals . .	viii
Plants . . .	viii
NEW BRITISH SPECIES—	
Animals . .	ix
Plants . . .	ix
REVIEWS . . .	x
LIST OF CONTRIBUTORS .	x
ILLUSTRATIONS . .	xi
ERRATA . . .	xi

GENERAL INDEX.

Abnormal Plants, Notes on	118
A Botanical Ramble in Glenshee	75
Acherontia atropos	292
Acronycta myricæ not a distinct Species	199
Additional localities of Scottish Coleoptera	248
A deceived Bee	199
Alchemilla conjuncta	119
Anecdote of the Manx Puffin of the Dardanelles . . .	198
A new British Peziza	79
A new Scottish Lichen	300
Animal Psychosis, Further remarks on	1
A supposed undescribed Lepisma	46
Bee, A deceived	199
Berteroa incana	170
Bird names in Orkney	9
Birds of the South-east of Scotland, The . . .	277, 325, 332
Birds, Prevention of extermination of rare	47

40154

Bog mosses 170
Botanical ramble in Glenshee, A 75
Botany of Glen Tilt, Note on the Zoology and . . . 160
British Species of Oporabia, Some notes on the . . 111, 158
Bryological notes 59

Capture of Catocala fraxini in Berwickshire 12
" Vanessa antiopa 116, 340, 341
Catocala nupta 12
Coleoptera, Additional localities of Scottish 248
Coleoptera of Scotland, The . . 35, 80, 129, 176, 223, 273, 322, 362
Colias edusa 199
" in Berwickshire 117
" in Dumfriesshire 117
" in Galloway 117
" in Orkney 160
" in Perthshire 117
" in the South-west of Scotland 117
Contributions to the Desmid Flora of Perthshire . . . 68
Convolvulus arvensis as an unintended ornamental climber . . 30
Cryptogamic Society of Scotland, The . . 22, 119, 215, 304, 348
Cynipidæ, Alternation of generations in the . . . 117, 152, 292

Dead Wood-pigeons 292
Descriptions of new Lichens 164
Desmid Flora of Perthshire, Contributions to the . . . 68
Does alternation of generations or dimorphism occur in the European Cynipidæ? 152

Eupithecia togata and Stigmonota perlepidana . . . 297
Exidia repanda 79
Exotic Fungi from Glasgow Botanic Garden . . . 78

Fungi, New Scottish 255
" from Glasgow Botanic Gardens, Rare . . . 30
" " " Exotic . . . 78
" Observations on the recurrence of the rarer . . . 18
" Rare British 79
Further notes on the species of Oporabia 158
" remarks on Animal Psychosis 1

Galls, Scottish 13, 168, 203
Glen Tilt; its Fauna and Flora . . . 181, 244, 300
Gold-field and Gold-diggings of Crawford-Lindsay (Lanarkshire), The 208, 256, 305, 349
Gold in Perthshire, Native 268
Guillemots colliding 249
Gynandromorphism in the Honey-bee 199

Has Melitæa didyma occurred in Scotland? 48
Hymenoptera, Notes on Scottish 11

Kites 10

Lepidoptera of Moncreiffe Hill, The . 38, 99, 144, 191, 241, 293, 334
" Scotland, The . . 31, 120, 173, 216, 269, 319
Lepisma, A supposed undescribed 46
Lichen, A new Scottish 300
Lichens belonging to the genus Parmelia, On certain . 200, 252, 298
" Descriptions of new 164
" New or rare 27

Migration of the Starling 10
Migration, On 85, 133, 229, 283
Mustela erminea 160
Mycological notes 250, 304

Native Gold in Perthshire 268
New or rare Lichens 27
" Scottish Fungi 255
Note for Mycologists 30
" on Mnium punctatum var. elatum 207
" on the Kestrel 46
" on the Zoology and Botany of Glen Tilt . . . 160
Notes on Abnormal Plants 118
" on Cryptogams 78
" on Lathræa squamaria 119
" on Scottish Hymenoptera 11
" Various 249
Notice of the Wryneck being found in Scotland . . . 333

Observations on the recurrence of the rarer Fungi . . . 18
On certain Lichens belonging to the genus Parmelia . . 200, 252
On Migration 85, 133, 229, 283
On the distribution of Buxbaumia aphylla in the west of Scotland . 78
On the occurrence of Picus major L. in Aberdeenshire, and its habits and food 10
On Uredo filicum Desm. and Uredo? pteridum n. sp. . . 26
Oporabia, Some notes on the British species of . . 111, 158

Pachnobia hyperborea var. alpina 12, 341
Parthenogenesis in Nematus miliaris 157
Peziza, A new British 79
Porphyrio smaragdonetus Temm. in Scotland . . . 37
Prevention of the extermination of rare Birds . . 47, 116
Puffin of the Dardanelles, Anecdote of the Manx . . . 198

Rare British Fungi 79
" Plants from Ben Lomond 119
Rook-literature 318
Rosa micrantha in Scotland 254

Scottish Galls 13, 168, 203
Short-sighted policy 249
Some notes on the British species of Oporabia . . . 111
Sphinx convolvuli 10
" in Fife 199
Structure of the common Mushroom 64
Supplementary list of Fungi found within the province of Moray . 342

Tenthredinidæ in Braemar 10
The birds of the South-east of Scotland . . . 277, 325, 332
The Coleoptera of Scotland . . 35, 80, 129, 176, 223, 273, 322, 362
The Gold-field and Gold-diggings of Crawford-Lindsay (Lanarkshire) 208, 256, 305, 349
The Lepidoptera of Moncreiffe Hill . 38, 99, 144, 191, 241, 293, 334
" Scotland . . . 31, 120, 173, 216, 269, 319

Various notes 249

Waste of life at St Abb's Head 116
Wood-pigeons, Dead 292

SPECIES SPECIALLY NOTICED.

(*See also New, and New British, Species.*)

ANIMALS.

Mammals—
Mustela erminea . . 160
Red deer . . . 184

BIRDS.

Budytes Rayi . . 283
Caparcaillie . . . 199
Cross-bill . . . 97
Guillemot . . . 249
House-martin . 186, 285
Kestrel . . . 46
Kite 10
Manx Puffin . . . 198
Picus major . . . 10
Quail . . . 139
Ruby-crowned Wren . 291
Starling . . . 10
Swallow . . . 98, 134
Syrrhaptis paradoxus . 290
Wood-cock . . . 288
Wood-pigeon . 289, 292
Wryneck . . . 333

INSECTS.

Acherontia atropos . . 292
Acronycta euphorbiæ var. montivaga 189, 199
" myricæ . . 199
Anticlea sinuata . . 189
Catocala fraxini . . 12
" nupta . . 12
Chœrocampa porcellus . 45
Chrysocoris festaliella . 341
Coccyx distinctana . . 341
Colias edusa . 117, 160, 199
Coremia ferrugata . . 190
Crymodes exulis . . 189
Deilephela galii . . 44
Erebia Æthiops . . 187
Eupithecia togata . . 297
Hepialus humuli . . 100
Honey-bee . . . 199
Hybernia defoliaria . . 195
Leptotena cervi . . 185
Melanippe galiata . . 190
Melitæa didyma . . 48

Nematus miliaris . . 157
Œstrus elaphi . . 185
Oporabia autumnaria 113, 160
" dilutata . 113, 159
" filigrammaria 113, 160
Pachnobia hyperborea 12, 189, 341
Satyrus Hyperanthus . 42
Sphinx convolvuli . 10, 199
Stigmonota perlepidana . 297
Vanessa antiopa . 116, 340, 341

MOLLUSCA.

Bulimus obscurus . . 247
Helix arbustorum . . 247
" " var. alpestris 247
" fusca . . . 247
" nemoralis var. . 247

PLANTS.

FLOWERING.

Alchemilla conjuncta . 119
Berteroa incana . . 170
Convolvulus arvensis . 30
Daisy . . . 118
Draba inflata . . 77
Epilobium rosmarinifolium . 303
Lathræa squamaria . . 119
Polygonatum verticillatum . 301
Primrose . . . 118
Rosa micrantha . . 254
Thlaspi alpestre . . 77
Veronica saxatilis . . 303
Vicia orobus . . 302

CRYPTOGAMIC.

Mosses.

Anacalypta latifolia . . 77
Buxbaumia aphylla . . 78
Campylopus Schimperi . 78
Dicranella Grevilleana . 60, 78
Hypnum giganteum . . 77
Leucobryum glaucum in fruit 119
Mnium punctatum var. elatum 207
" spinosum . . 78
Neckera pennata . . 61
Tortula Hornschuchiana . 76
Zygodon aristatus . . 60
" rupestris . . 59
" Stirtoni . . 59

Hepaticæ.

Jungermannia fragilifolia . 77

Fungi.

Agaricus campestris . . 64
" caput-Medusæ . 20
" carbonarius . 18
" cucumis . . 21
" echinosporus . 30
" euchrous . . 19, 22
" maritimus . . 20
" nummularius . 20
" storea . . 19
Cortinarius claricolor . 21
" sebaceus . 20
Hypocrea riccioidea . . 304
Lentinus scoticus . . 20
Leotia circinans . . 20
Lepiota georginæ . . 30
Merulius himantoides . 30
Œcidium orobi, var. phaseoli 79
Pleurotus gadinoides . 30
Polyporus cinnabarinus . 79
" destructor . 251
" pergameus . 79
" sanguineus . 79
Ptychogaster albus . . 250
Puccinia bistortæ . . 76
Sphæria parallela . . 79
Stereum lobatum . . 79
Trichobasis rumicum . 79
Uredo filicum . . . 27
Xylaria polymorpha . . 234

GALLED PLANTS.

Acer pseudoplatanus . 14
Agrostis canina . . 17
Alnus glutinosa . . 205
Betula alba . . . 17, 204
Centaurea nigra . . 15
Corylus avellana . . 17
Cratægus oxyacantha . 14
Erophila verna . . 13
Galium aparine . . 15
" saxatile . . 15, 169
" verum . . 204
Heracleum sphondylium . 15
Hieracium boreale . . 16
" sylvaticum . 16
Hypochœris radicata . 16
Lotus major . . . 168
Pimpinella saxifraga . 15
Plantago lanceolata . . 16

Potentilla tormentilla . 14
Prunus communis . . 14
Pyrus aria . . . 169
Quercus robur . . . 16
Stellaria holostea . . 13
Thlaspi arvense . . 168
Tilia europea . . 203
Trifolium repens . . 14
Veronica serpyllifolia . 170
Vicia cracca . . 169

FAMILIES INCLUDED IN INSECTA SCOTICA.

Lepidoptera.

Boarmiidæ . . . 32
Euboliidæ . . . 317
Fidoniidæ . . . 31
Hyberniidæ . . . 34
Larentiidæ . . . 321
Sionidæ . . . 321

Coleoptera.

Buprestidæ . . . 180
Byrrhidæ . . . 130
Cissidæ . . . 324
Cleridæ . . . 276
Cryptophagidæ . . 36
Cucujidæ . . . 35
Dascillidæ . . . 227
Dermestidæ . . . 130
Elateridæ . . . 224
Georyssidæ . . . 131
Heteroceridæ . . 131
Lagriidæ . . . 365
Lathridiidæ . . . 83
Limexylonidæ . . 322
Lucanidæ . . . 176
Malacodermidæ . . 228
Melandryadidæ . . 364
Mycetophagidæ . . 129
Parnidæ . . . 131
Ptinidæ . . . 322
Pythidæ . . . 363
Scarabæidæ . . . 176
Tenebrionidæ . . 362
Throscidæ . . . 223

NEW SPECIES AND VARIETIES

Described in this volume.

ANIMALS.

INSECTS.

Hemiptera.

Orthezia Signoreti B. W. (*Scotland*) . . . 161

Hymenoptera.

Tenthredo velox F., var. nigrolineata Cam. (*Scotland*) . 11

Lepidoptera.

Oporabia addendaria B. W. = autumnaria Dbd. *non.* Bdv. . . . 160

Thera variata Schiff. var. obliterata B. W. (*Scotland*) . 217

PLANTS.

MOSSES.

Coscinodon Patersoni, Ferg. (*Scotland*) . . . 62

LICHENS.

Lecidea antiloga Stirton (*Scotl.*) 164
" contortula " " 167
" endocyanea " " 165
" interpolata " " 165
" mullensis " " 166
" orphnœilla " " 166
" pissodes " " 166
" polysita " " 28

Lecidea soreumidea, Stirton (*Scotl.*) 28
" sporeta " " 166
" uliginascens " " 165
Lithographa Andrewii " " 300
Melaspilea Patersoni " " 29
Opegrapha constrictella " " 29
Pannaria lasiella " " 164
Parmelia amplectens " (*India*) 201
" coilocarpa " (*W. Africa*) . . 202
" cyathina, Stirton (*Queensland*) . 252
" erubescens, Stirton (*Queensland*) . 201
" euneta, Stirton (*S. Africa*) . . 298
" euflecta, Stirton (*Queensland and Bahia*) 299
" flaventior, Stirton (*Brazil*) . . 254
" nigrescens, Stirton (*New Zealand*) . 253
" nitescens, Stirton (*Queensland*) . 299
" permutata, Stirton (*Queensland*) . 252
" platycarpa, Stirton (*Queensland*) . 252
" reddenda, Stirton (*Scotland*) . 298
" reparata, Stirton (*Queensland*) . 201
Parmelia resupina, Stirton (*S. Africa*) . 298
" subalbicans, Stirton (*New Zealand*) . 245
" suffixa, Stirton (*S. Africa*) . 299
" testacea, Stirton (*New Zealana*) . 203
" toxodes, Stirton (*S. Africa*) . 253
" xanthotropa, Stirton (*S. Africa*) . 202
Pertusaria reducta, Stirton (*Scotland*) . . . 28

FUNGI.

New genus.

Milesia B. W. . . . 162

New species.

Bactridium acutum B. and B. W. (*Scotland*) . . 162
Dactylium modestum B. and B. W. (*Scotland*) 162
" spirale B. and B. W. (*Scotland*) . 162
Milesia polypodii B. W. (*Scotland*) . . . 163
Uredo? pteridum B. W. (*England*) . . 27

DESMID.

Penium rufopellitum Roy (*Scotland*) . . . 73

NEW BRITISH SPECIES

Brought forward in this volume.

ANIMALS.

BIRDS.

Porphyrio smaragdonotus Temm. 37

INSECTS.

Andricus æstivalis Gir. . 11
Ceroptres cerri Mayr . 12
Torymus hibernans . . 12

PLANTS.

MOSSES.

Bryum cyclophyllum . . 61
Hypnum Lorentzianum Molendo 62

FUNGI.

Exidia repanda Fr. . . 79
Leptonia æthiops Scop. . . 22
Mycena plicosus Fr. . 22
Omphalia pictus Fr. . 22
Peziza amentacea Balb. . 79
Tympanis pinastri . . 79

DESMID.

Cosmarium cymatopleurum Norst. . . . 71

REVIEWS.

Carrington and Pearson's 'British Hepaticæ' . . . 318
'European Butterflies and Moths' 361
'Fauna and Flora of Clydesdale' 48
'Hemiptera Gymnocerata Europæ' 318
'Proceedings of Nat. Hist. Soc. of Glasgow,' Vol. iii. Pt. i. . 58
" " " " Pt. ii. . 214
'The Fauna of Scotland, with especial reference to Clydesdale and the Western District.' Hymenoptera. Part I. . . 361
'The Midland Naturalist' 249
'Transactions of the Glasgow Society of Field Naturalists,' Pt. iv. . 58
" " " " Pt. v. . 214

LIST OF CONTRIBUTORS.

Boswell, J. T., LL.D., F.L.S. 199
Brotherston, A. 254, 292, 332
Brown, J. A. Harvie, F.Z.S. 47, 249
Buchan Hepburn, A. 248
Cameron, P. 10, 11, 152
Christie, A. Craig 341
Drummond-Hay, Colonel H. M., C.M.Z.S. 37, 85, 133, 229, 283, 333
Fergusson, Rev. J. 59, 75, 207
Flett, W. 199
Gurney, jun., J. H., F.Z.S. . . . 116, 198, 249, 292
Herd, W. 117
Herdman, Rev. W. 10, 30, 116, 170
Keith, Rev. J., M.A 79, 342
Lindsay, W. Lauder, M.D., F.R.S.E., F.L.S. 208, 256, 268, 305, 349
M'Andrew, J. 160, 199
M'Intosh, W.C., M.D., LL.D., F.R.S., F.L.S. . . . 46
Moncreiffe, Sir T., Bart. . 38, 99, 144, 191, 241, 293, 297, 334, 341
Newton, Professor A., F.R.S., F.Z.S. 318
Paterson, A., M.D. 10
Paterson, Professor R. H. 30, 78, 118, 116
Power, J. A. 340
Robinson-Douglas, W. D., B.A., F.L.S., F.R.G.S. . . 117, 160
Roy, J. 68
Service, R. 117
Sharp, D., M.B. . . . 35, 80, 129, 176, 223, 273, 322, 362
Shaw, W. 12, 117
Sim, J. 170

Skeete, Horace 199
Smith, W. G., F.L.S. 64
Stevenson, Rev. J. 18, 30, 250, 304
Stirton, J., M.D., F.L.S. . . . 27, 164, 200, 252, 298, 300
Tait, W. 160
Thompson, D'Arcy W. 277, 325
Trail, Professor J. W. H., M.A., M.B., F.L.S. . 9, 10, 13, 168, 203
Wardrop, Rev. J. 1
White, F. Buchanan, M.D., F.L.S. 12, 26, 31, 40, 48, 79, 111, 116, 117, 120, 158, 160, 173, 181, 199, 216, 244, 255, 269, 300, 319, 341

ILLUSTRATIONS.

Structure of the Common Mushroom.
Fig. 1. Section through gill 65
" 2. Section through spore-bearing surface . . . 66
" 3. Development of spores 67
Plate I. Details of structure of species of the genus Oporabia, to face page 116
Fig. A. Oporabia dilutata.
" B. " autumnaria (addendaria).
" C. " filigrammaria.
Plate II. To face page 163
Fig. 1. Orthezia Signoreti B. W.
" 2. Dactylium modestum B. and B. W.
" 3. " spirale B. and B. W.
" 4. Bactridium acutum B. and B. W.
" 5. Milesia polypodii B. W.
" 6. Puccinia pteridum B. W.
" 7. Uredo filicum Dessn.
Diagram of Cyclone in the Bermudas. 234

ERRATA.

Page	11,	line	10	from top,	*for*	"Thompson"	*read* "Thomson."
"	"	"	27	"	"	"*Blenocampa*"	" "*Blennocampa.*"
"	"	"	33	"	"	"*Mœcrophya*"	" "*Macrophya.*"
"	12,	"	9	"	"	"*hiberans*"	" "*hibernans.*"
"	"	"	10	"	"	"*nemoterus*"	" "*neuroterus.*"

Page	12,	line	14	from top,	*for*	"*phynogaster*"	*read*	"*pyrrhogaster*."
"	"	"	15	"	"	"*Stenaphrus*"	"	"*Stenophrus*."
"	32,	"	8	from bottom,	"	"Solway"	"	"Tweed."
"	33,	"	1	at top,	"	"BORMIA"	"	"BOARMIA."
"	46,	"	20	from top,	"	"representation"	"	"representative."
"	48,	"	9	"	"	"*Argynuis*"	"	"*Argynnis*."
"	56,	"	8	"	"	"Moselcy"	"	"Moseley."
"	121,	"	14	"	*above*	"CHEIMATOBIA"	*insert*	"LARENTIIDÆ."
"	224,	"	7	"	*for*	"LYTHROPTHERUS"	*read*	"LYTHROPTERUS."

N.B.—In vol. iii. pp. 360 and 364, in the distribution of *Geometra papilionaria* and *Cabera exanthemata*, *for* "East. Solway" *read* "East. Tweed."

THE SCOTTISH NATURALIST.

VOLUME THE FOURTH.

ZOOLOGY.

FURTHER REMARKS ON ANIMAL PSYCHOSIS.

By the Rev. J. WARDROP.

(Continued from Vol. III., p. 289.)

ii. SENSIBILITY or sensitive intelligence is a power of a different kind and peculiarly animal. Here the outer nervous circle does not act mechanically by itself. The different movements stimulate the inner circle, so as to excite feeling or sensation, including sensitiveness to pain, and ideas or rather images, and affections and emotions; that is to say, in this mode of action, the seat and essence of mind are reached. It is impossible to interpret the actions of animals, in a good many of their spheres of action, without ascribing to them powers of an intelligent nature. As we know feeling, emotion, ideas, and images in ourselves, so must we own them to be in animals,—and that is, only as psychical and not simply as organic functions. And, in sensibility, not only are these capacities of mind aroused, but they intermediate and condition the outgoing action. The outgoing movement in response to the ingoing does not pass immediately through the central union of the afferent and efferent nerves as in reflex action. It starts from the seat of mental power as its immediate and determining source, and thus gets the character not of mechanical, but of intelligent adaptation and purposiveness. The

remarkable thing here, and what is much to our present purpose, is, that these mental manifestations are exhibited in man in the *unconscious* state—in states in which not only will is in abeyance, but in which even consciousness is absent; *i.e.*, they appear in an entirely automatic manner. I say this is to the present purpose, because the phenomena exhibited in these unconscious states,—whether abnormal, such as dreaming, somnambulism or insanity, or normal,—for the mind works in this so-called latent or unconscious manner as a regular function of its life,—show something so closely resembling the whole psychical manifestations of animals, that it is impossible to resist the conviction that in such unconscious cerebration or latent operation of mind we have so far a clue to the secret of the animal soul. Had Des Cartes been acquainted with the unconscious action of mind (it was Leibnitz that gave it prominence in philosophy, as it was Laycock and Carpenter, that found for it physiological basis), it is not to be doubted he would have employed it to explain what simple reflex action of the organism leaves unexplained. Nothing is more surprising than Mr. Huxley's declining to utilise automatic mental action in dealing with the manifestations of a psychical nature in animals—nothing more surprising except the fact that, so declining, he yet allows in animals the existence of ideas, images, and other "states of consciousness."

Undoubtedly the human soul must supply the key for opening the mystery of the animal soul; and, apparently, in the human soul, what is to be looked to for the desiderated fruitful analogy is, more especially, the phenomenon of action, spontaneous, unconscious, and undetermined by the will of the agent. The comparative psychologist ought to narrow the parallel between the two orders of intelligence to this region of action, and give it special study. Failure to take proper account of the unconscious automatic action of the human intelligence, or even to make mention of so significant a fact, is quite common both with philosophers and scientists; and it must be held that this oversight—this almost exclusive recognition of self-conscious self-determined mind, is fatal, and so long as it is persevered in must continue to be fatal, to any successful result in dealing with the animal problem.

Even Calderwood in his "Handbook of Moral Philosophy," says (p. 104), "Whether in lower forms of life there may be feelings or sensibility apart from consciousness, and by mere

irritability and contractibility of animal tissue, I do not undertake to say." Now, overlooking the inconceivability of their being "feelings or sensibility" "by mere irritability and contractibility of animal tissue," is there no term or fact between consciousness and irritability? May there not "be feelings or sensibility apart from consciousness" and yet not by mere irritability and contractibility of animal tissue? "Conscious" and "psychical" or "mental" are words that should not be used co-extensively.

In the *Contemporary Review* for Sept. 1875—p. 622, *et seqq.*—there is an interesting paper by Lord Blachford, containing a criticism of the views on Automatism of Dr. Carpenter and others. In these views his Lordship describes "molecular movement" as being "invested with a quasi-magical" or "transcendental power." On atoms, he says, there is imposed a "capacity so totally foreign to them as that of supplying the place of contrivance." And the paper sums up—"The question is, what is the link which, in brutes, connects the action of the sensory with that of the motor nerves, so as to account for the infinite variety of phenomena which we usually interpret to indicate hope, fear, pleasure, pain, anger, love, cunning? The one answer is, it is a sensitive nature; the other, it is something else. In the one case we refer them to a cause we know in ourselves; in the other, without warrant, they are referred to a cause, the nature and appropriateness of which are unknown?" All this forgets or altogether undervalues the latent action of soul, which Dr. Carpenter at least inserts as a third term between molecular and conscious action. In reference to a sensitive nature, the question is, what is absolutely necessary to it? Is the kind of consciousness which we self-conscious beings know we possess essential to it? Nay, is not, even in us, the action of a sensitive nature competent with such consciousness in abeyance?

In a letter in "Mind," vol. I., pp. 131-4, "On the Automatic theory of animal activity," in which Dr. Carpenter is again subjected to criticism, Mr. Alexander Main, Arbroath, says, to conclude with, "Philosophers may safely challenge physiologists even to state the automatic theory without contradiction." When the unconscious action of intelligence is admitted, and it is a fact that will be disputed by no one who takes care to acquaint himself with the phenomena, a statement of the automatic theory, equal in consistency and in verisimilitude, is easy

The special study of latent mental operation is what is to be desiderated also in the valuable and world-wide researches of Dr. Lauder Lindsay on animal psychical phenomena. These researches, I consider, are in danger of being more fruitless than they ought to be from the want of adequate theorising—let the theory be sought from mental latency in man, or from any other quarter. Theory in reference to the animal soul is indispensable, and is what is now to be specially attempted. Facts about the animal soul are not and never shall be the science thereof.

Dr. Lindsay has in this matter of studying the animal soul, commended to my attention a series of books. Some of them are valuable books. I am not aware that one, who might be working at a theory of animal intelligence, should suffer materially from not having read the first and last in the list viz., "Man and beast, here and hereafter," by the Rev. J. G. Wood; and Maurice Girard's work on Insects—the section on instinct and intelligence; and as to the others I am not aware that I had manifested ignorance of them. I thought I had utilised their matter and their spirit as far as it was possible or wise to do so, in the line of inquiry I was pursuing. One of them, "The Reasoning Power in Animals," by the Rev. J. T. Watson, M.A., is a copious, interesting, and valuable collections of facts bearing on animal instinct and intelligence. Such facts are of course indispensable, and the more of them, well observed and truthfully told, the better. But are we to go on till doomsday collecting facts, and not to presume that those already at hand require explanation, and may, through that explanation, advance, farther than has been hitherto reached, the solution of the general problem that lends them their chiefest value and interest. In truth, I despair of ever getting facts that shall suggest the solution, or prove it, if those already gathered, were their significance for the end only exhausted, do not. The facts already observed, and on record, are indicative of wonderful intelligence, and of an equally wonderful degree of other psychical powers and passions. No fact of intelligence or of affection in animals, that could be observed in time to come, however striking or mysterious, would surprise me, after what of wonder we already know in that quarter, except the fact that should be of such a nature as clearly and unmistakably to imply, in the animal-agent, self-conscious, self-regulated action. For my part, if a fact of that kind were observed, I should be

surprised—surprised on two accounts; *first*, because such a fact would at last wholly undo any distinction in kind between man and animal; and *second*, because, when there was in reality no such distinction, the fact to show there was none had been so long in making its appearance. If such a fact were established, it would be decisive. On the day of its discovery, we might have to say, we have found strange things to-day; but we would rejoice to have got the truth at last. I do not think such a fact, or any fact quite near it, is yet on record. None of the facts which I have seen or heard, with all their difficulty of psychological analysis and explanation, can be held necessarily to demand a self-conscious, self-regulated intelligence, as their source.

The third book in Dr. Lindsay's list is Dr. Draper's well-known "History of the conflict between Science and Religion." In reference to it, I have to say, that a more unfair history by a more biassed historian, it were hard to find between the two boards of any book on any side of the Atlantic. Dr. Draper's book is a beacon, not a model.

Herbert Spencer's "Study of Sociology," the fourth book to which I am referred, is one of a different and higher order. Comparatively, it is candid, and fair, and penetrating; and its theorising spirit is admirable, while its research is immense. All Spencer's writings are infinitely valuable, even to those, or I should say, most of all to those, whose thinking leads them to conclusions farthest away from such as the books themselves teach. Spencer is unable to deal with facts in the way of simply recording and mechanically classifying them. His theorising tendencies draw him on to a laborious treatment of his facts of a kind higher than a mere narrative. That theorising faculty and its exercise, though not all the theories that are its product, I beg to commend to Dr. Lindsay, *in re* the animal soul. The two volumes last named belong to the able and useful and deservedly popular series, "The International Scientific series.' When Dr. Lindsay's promised volume, for which we have waited always with great interest, and now wait with not a little impatience also, shall have taken its place by their side in the same series, no reader shall be held competently posted up in the subject who has not read it. But if it shall accomplish nothing beyond what the article in the "Journal of Mental Science," and some other writings of similar contents, have accomplished; if it present only a vast accumulation of facts of animal instinct and intelligence, arranged though they should

be under all the possible rubrics that can be needed to chapter off the faculties of the human mind, and then conclude with an easy and uncritical proclamation that these facts, manifesting intelligent powers, moral feelings, and religious instincts, therefore show an identity in kind between the animal and human soul,—if that shall be the full tale of the work of the coming book, and so long as it shall be the full tale of the achievements of any number of coming books, then and so long the adequate book on the animal soul, with the adequate conclusions at least initiated, we shall still have *sine die* to wait and wish for.

With respect, farther, to the common oversight of unconscious mental operation, even Dr. Carpenter, who has done so much to direct attention to the automatic action of intelligence, does not seem always to give sufficient room, or to do full justice to the fact. I cannot find even entire consistency in his utterances. It is hardly possible to conclude whether he holds his sensori-motor action to be conscious or unconscious. He plainly hesitates to allow of unconscious, or automatic sensibility. Thus, (Mental Physiology, p. 148), He says, "Sensation is that primary change in the condition of the conscious *Ego*, which results from some change in the condition of the *Non-ego* or external world." And he adds, in a note, "Some physiologists, it is true, have spoken of sensation without consciousness; but it seems very desirable, for the sake of clearness and accuracy, to limit the application of the word to the *mental* change." If there be unconscious sensibility, this is not vigorous or accurate: for in that case, "mental" and "conscious" are not identical, nor are "mental" and "unconscious" mutually exclusive. Though sensation has always mental elements, it has not necessarily always the accompaniment of consciousness. (Ment. Phys. p. 55, and 182; and Human Physiology, p. 740-2. 4th Ed.—in which places unconscious sensation seems to be admitted).

In "Mind" vol. 1. pp. 158-9, G. H. Lewes divides the matter of "unconscious sensations" between the physiologist and the psychologist, as follows: "The physiologist finds himself compelled to speak of 'unconscious sensations,' if he would explain many phenomena." "He has to interpret these phenomena in terms of matter and motion." "To the psychologist, such language" as 'unconscious sensation,' is nonsense equivalent to 'unfelt feelings,' or 'invisible light.'" If the physiologist and psychologist, severally, can deal with

"unconscious sensation" only after this sort, we had better apply to one who is neither of them, or rather who is both of them, and see if we cannot get something more satisfactory. Sensations, either conscious or unconscious, are not interpretable in terms of matter and motion, merely. And if the physiologist can interpret them only thus, then they are beyond his analysis. The psychologist is not shut up to call "unconscious sensations" nonsense. He is far more fitted to deal with wonders than the physiologist—at least the wonders that attach to "neural processes," and come to perplex the terms of mere "matter and motion." It is just his province, while he rises up through material phonomena, and carries their terms with him for the explanation that they may find it impossible to get on their own platform, to occupy a higher range of fact and to find causes and movements which though they may look away to new and farther mysteries, yet solve at least the difficulties of the regions lower down. "The reaction of a sensory organ," as a name for a sensation in the physiologist's mouth, or, for the same, "mental process," is to the psychologist, much greater nonsense than the expression "unconscious sensations."

Mr. Lewes has well drawn attention to "the many difficulties which lie in the way of psychological investigation," complicated as they are "by the deplorable and inevitable ambiguity of communication, resulting from an absence o strictly defined technical terms" (Mind No. 2, art. i). These difficulties will not be removed out of the region with which we have been concerned in this paper, till the phenomena of unconsciousness are better expiscated than Mr. Lewes has done in the articles from which we have quoted. The word "consciousness," must be confined to the mental action that is characteristic alone of self-conscious, self-regulated minds. Then we shall find a precise and special name for *unconscious* sensitive intelligence, as we find it apparently a precise and and special fact.

iii. Volition is, like sensibility, a power of intelligence, but it is one of a very different and much higher kind. The possession of this power is to man matter of inward experience, or consciousness. We have no higher evidence of anything than we have of our possession of this power. But observation shows that much of our action, that, from its adaptiveness and purposive character, might be ascribed to intention or will, is not voluntary, either mediately or immediately, but is due to

the automatic action of the mind. This fact, so important for the explanation of animal phenomena throughout, affords the ground on which it can be made to appear that animals are not endowed as man is with the power of voluntary action, with self-determining self-regulating power. Mr. Huxley has said "We have as good evidence that animals have will as that they have sensation; and as good evidence that they have both sensation and volition as that man has them." The Duke of Argyle joins him in the latter part of the statement, which of course includes the former. I am unable to see how the statement can be supported I think it must be denied in both its affirmations, and on both on this single ground, that action, that looks and is of an intelligent character, adaptive and purposive, is not thereby proved to be truly voluntary action. Much action, by being intelligent, simulates will, in which yet there is no will. In reference to the first statement, that there is "as good evidence that animals have volition as that they have sensation," it is certainly against facts to say that there are any actions in animals that as imperatively demand will for their explanation, as there are actions that demand for their explanation sensation. We cannot at all explain the actions of animals without the latter. We can explain it without the former. And in reference to the second statement, that there is as good evidence that animals possess sensation and volition, as that man possesses them, it is of course granted that animals, as well as men, have sensitive power. But it is not so granted in reference to will for men have inward experience of the possession of voluntary power, whereas in animals, observation detects only such action as may be referable to a source of action known as existing also in man—automatic mental power. If the statement had been, there is as good evidence that animals possess intelligent power as that they have sensation, and as good evidence that they have intelligent power and sensation as that men have them, it might have stood. But when a distinction is drawn, as facts compel us to draw it, between intelligent action simply, and intelligent action that is also voluntary or intentional, the statement cannot be maintained. The evidence that animals have the power of volition is not so good as the evidence that man has that power, or as the evidence that they themselves have sensation. It is not substantiated evidence at all. If there had been no action in man, that looks like the action of free self-determination and purpose, and yet is not

that, but is only automatic, we of course could never have surmised that the action of animals was aught else than free and self-determined, whatever might have been the difficulties and even impracticabilities of such a conclusion. But there is such action in man; and the fact at once suggests a new line of investigation, and, as probable, a new and different conclusion.

Bird-names in Orkney.—As local names are of interest to not a few, and as they are probably doomed to extinction in their native localities in no long time, I subjoin some of those that I was accustomed to hear and to use in Orkney, a few years ago. If they have been published elsewhere I have not met in with any list of Orkney names, which may serve as my excuse for their publication here. It will be seen that a good many of them are also in common use in other parts of Scotland, probably owing to the Scotch settlers in the islands of Orkney having introduced with themselves the names to which they were accustomed.

Owl, Cataface; Raven, Corbie; Sparrow, Spurdie; Waterwagtail, Willy-wagtail, or Watery-wagtail; Common Bunting, Skitterbroltie; Snow-bunting, Snowfleck; Wren, Wranock; Lark, Lavrie or Lavrock; Meadow Pipit, Teetan, Titock, Titlark, or Hillsparrow; Rock Pipit, Gutterteetan or Shoreteetan; Linnet, Lintie, Lintwhite, Lintock, Rose Lintie; Mountain Linnet, same as Linnet, and also Hill Lintie; Wheatear, Chack; Ring-ouzel, Hillchack, or Flittingchack; Red-grouse, Muirfowl, or Muirhen; Lapwing, Teeuck, or Teeou; Ringed Plover, Sand-lark, Sanlou, Sand-lavrock, or Stoneplover; Dunlin, Bundie or Ploverpage; Sandpiper, Steeniepouter, Watery-pleeps, or Bundie; Snipe, Horse-gowk; Redshank, Watery-pleeps; Curlew, Whaup; Wild-duck, Stock-duck; Tern, (Arctic, Common, &c.), Rittock, Pickatarney, or Sheartail; Goosander, Rantock; Northern Diver, Immer, or Emmer-goose, Kittywake, Kittyweeack; Gull, (Common, Herring, and Black-backed), Whitemaw, the young birds before assuming the adult plumage are called Scories; Skua, Scutiallan; Cormorant, Scart or Scarf; Little Auk, Rotch; Common Guillemot, Auk; Black Guillemot, Tyst, or Tystie; Puffin, Coulterneb, or Tammie-norie; Red-necked Phalarope, Haf-wel. The Ring-ouzel has received the name of *Hillchack* from its note, and from its frequenting hilly places. The name *Flittingchack* has been given to it from a belief, current in some places, that when one is seen near a house, it betokens the speedy death of one of the occupants, or else that the family will soon '*flit*' to some other locality. The bird is rare in Orkney. The Wheatear also has received the name '*chack*' from its harsh note. It is very abundant in Orkney, and is persecuted by herds and other boys, because toads (called in Orkney *Huptous*) are believed by them to sit on the Wheatear's eggs and to hateh the young birds. As toads in Orkney, as well as elsewhere, are believed to be very poisonous, the birds share the character of being 'uncanny' animals. The story has probably originated in the fact of toads being sometimes found under the same stones as the nests.

There is a common belief in Orkney that Corncraiks 'sleep' all winter, and I have been told of cases in support of the belief, but never could ascertain a reliable case of one being found in a state of hybernation. They are generally heard in Orkney about the middle of May.—JAMES W. H. TRAIL.

On the Occurrence of Picus major Lin. (Greater Spotted Woodpecker) in Aberdeenshire, and its habits and food.—About a week ago Mr. Wm. Robb shot a female of this species in the woods of Kincorth near Aberdeen, where he had seen it for a week or two before. It was sitting on the stump of a dead branch of a fir tree pecking at a fir cone when shot, and Mr. Robb brought away the branch with him as well as some of the cones, of which nearly a bushel were lying on the ground below the branch. The bird had scooped out the centre of the branch into a sort of gutter; and had contrived to fix the cones firmly at the bottom of the groove so as to keep them steady while it was breaking them up. On examining some of the cones I found that the seeds were gone, and on examining the stomach of the bird I found it full of portions of fir seeds with a few nearly complete seeds among the fragments, but not a trace of insects or of their larvæ.

Another specimen that Mr. Robb received from Straloch in Aberdeenshire a day or two afterwards proved to be a young male. In its stomach I found about a score of larvæ such as occur in rotten wood, but no trace of seeds.—JAMES W. H. TRAIL, 28th November 1876.

Migration of the Starling.—Starlings appear here in great force about February, and breed in the thick ivy on the Manse in nearly as close proximity to each other as a nest to each square yard of favourite wall. Having reared one or two broods—perhaps half-a-hundred young altogether, which they chiefly feed on the grub-worm—they depart about midsummer. They then return, or a considerable number of them, about the first of November, stay for a week, and again depart till spring.—W. HERDMAN, Rattray, Nov., 1876.

Kites.—At Blair Athole, in February last, Mr. Robertson, the factor, pointed out to me a pair of salmon-tailed Kites, (*F. Milvus* Temm.) sailing in the air, near his house, for a long time in their very characteristic manner, (something like that of sea-gulls, but smoother). He said that, so far as he knew, there was now only that pair in the locality, inhabiting the wooded crag west of the castle. They used to be abundant, but have been nearly extirpated by the keepers, which seems a pity, especially as their food is believed to be mostly reptiles and mice.—*Id.*

Sphinx convolvuli.—I beg to inform you that I captured about ten days ago, two fine specimens of this moth flying about the flowers of *Lilium auratum* in my greenhouse.—ALEXANDER PATERSON, Fernfield, Bridge of Allan, Oct. 4th, 1876.

Tenthredinidæ in Braemar.—As less than a dozen species of *Hymenoptera* of all families have been recorded from Braemar, I have thought that the publication of the following list of *Tenthredinidæ* might be of use. For

tbe opportunity of forming it, I am indebted to the collections of Drs. Buchanan White and Sharp, which they have had the goodness to lend me for examination. Among the species have occurred a number new to the British fauna—*Cimbex femorata* Fab. *Trichiosoma lucorum* L. ; *T. vitellinæ* L. ; *T. sorbi* Htg. *Abia sericea* L. *Hylotoma ustulata* L. *Lophyrus pini* L. ; *L. pallipes* Fall. ; *Cladius difformis* Pz. ; *C. padi* L. *Camponiscus luridiventris* Fall. *Dineura De-Geeri* Kl. ; *D. testaceipes* Kl. *Cræsus septentrionalis* L. ; *C. varus* D.V. ; *Nematus crassus* Fall. ; *N. ruficornis* var. *fraxini* H., and var. *appendiculatus* H. ; *N. abbreviatus* Htg. ; *N. puncticeps*, Thompson, Hymen., Scand., i. 92, 14. I am in doubts of this being the correct species, if that be even anything else than a var. of *ruficornis* ; *N. alnivorus* Cam. ; *N. pallipes* Fall. ; *N.* sp., a ♂ very like *pallipes* has been taken by Dr. Buchanan White, which will I think turn out to be a new species, but the males do not afford good specific characters ; *N. mollis* H. ; *N. interstitialis* Cam. was either taken in Braemar, or in Rannoch ; the specimen upon which the species was founded had turned mouldy, and it was unpinned and carded, and unfortunately the locality was then not noted. *N. ambiguus* Fall. was I think taken in Braemar, but I am not sure, the specimen being at present on the continent ; *N. obductus* H. ; *N. capreæ* Pz. (*Kirbyi* Thoms) ; *N. punctatus* Dbm. ; *N. hyperboreus* Thoms. ; *N. bilineata* Kl. ; *N. abdominalis* Pz. ; *N. luteus* Pz. ; *N. dorsatus* Cam. ; *N. melanocephalus* H. ; *N. myosotidis* F. ; *N. Zetterstedti* Dbm. ; *N. miliaris* Pz. ; *N. crassulus* Dbm., Thoms. ; *N. femoralis* Zadd. =(?) *ischnocerus* Thoms. ; *N. herbaceæ* Cam. ; *N. viminalis* L. ; *N. cinereæ* Thoms., (if this be distinct from *viminalis*) ; *N. gallicola*. *Cryptocampus saliceti* Fall. ; (?) *C. angustus* H. *Athalia rosæ* L. *Phœnusa pumila* Kl. *Emphytus carpini* H. *Hoplocampa cratægi* Klug. *Blenocampa nana* Kl. ; *B. pusilla* Kl ; *B. cinercipes* Kl. ; *B. fuscipennis* Fall. ; *B. albipes* Schr. ; *B. geniculatus* H. *(longicornis* H. ♂ *)*. *Selandria serva* Kl. ; *S. flavescens* Kl. ; *S. stramineipes* Kl. ; *S. morio* Kl. *Pœcilosoma obtusum* Kl. ; *P. pulveratum* Retz. ; *P. excisum* Thoms. *Strongylogaster cingulatus* Fab. ; *S. delicatulus*. *Sciopteryx costalis* Fab. *Allantus nothus* Kl. *Pachyprotasis rapæ* L. ; *P. simulans* Kl. *Mœrophya ribis* Schr. ; *M. albipunctata* Fall. (Muchalls, Dr. Trail). *Perineura instabilis* Kl. *Tenthredo mesomela* L. ; *T. olivacea* Kl ; *T. scalaris* Kl. ; *T. lateralis* Fab. ; *T. atra* L. ; *T. dispar* Kl. ; *T. livida* L. ; *T. balteata* Kl. ; *T. rufiventris* F. ; *T. velox* var. *nigrolineata* Cam., and *T. velox*, typical form. *Dolerus pratensis* Kl. ; *D. palustris* Kl. ; *D. gonager* Kl. ; *D. hæmatodis* Kl. ; *D. niger* L. ; *D. gibbosus* Kl. *Lyda pratensis* L. ; *L. depressa* Sch.—P. CAMERON, Glasgow.

Notes on Scotch Hymenoptera.—*Tenthredo velox* F., var. *nigrolineata* Cam. I propose to call by this name a variety of *T. velox*, which differs from the type in having the femora and four anterior tibiæ black on the upper surface in the female, just as they are coloured in the males. It is curious that this variety occurs in the same locality as the type.

Andricus æstivalis Gir.—This species, which I recorded doubtfully as a British insect in the "Entomologists' Monthly Magazine" for March, 1876, on the authority of a specimen taken at Ardlui, may now be added without any doubt to our lists, as the specimen in question agrees perfectly with a bred type of *A. æstivalis* which I received from Dr. Mayr, of Vienna.

Syntomaspis sp. I have bred from the galls of *Rhodites eglanteriæ*, a *Syntomaspis* very like *S. cyanea* Boh. (*Callimone curynotus* Walk.), but apparently quite distinct from that species. I have not, however, sufficient specimens to form a definite opinion on it, and wish to direct attention to its occurrence. *Cyanea* frequents the galls of *Dryophanta longiventris*, *D. divisa* and other oak galls. *S. pubescens* Först., has been reared from the galls of either *Rhodites centifoliæ* or *eglanteriæ*, but it is a quite distinct species from my insect.

Torymus hiberans Mayr. I am glad to be able to add this species to our fauna. It is attached as a parasite to the gall-fly *Nemoterus lenticularis*. My specimens are from Cadder Wilderness. *Diomorus armatus* Boh., I have taken in Rannoch.

Of other *Chalcididæ* it may be worth mentioning, that I have taken that curious insect *Micromelus phynogaster* Walk., at Kingussie, and *Calypso* (*Stenaphrus*) *compressus* Foer., at Milngavie.

Another interesting insect which I have captured this year is *Ceroptres cerri* Mayr., which I certainly did not expect to find in this district, as on the Continent it is attached as an inquiline to oak galls, which are not Scottish nor even British, and it will be interesting to discover whether it frequents some of our recorded native galls, or whether some of the galls which it frequents on the Continent are inhabitants of Scotland.

I am at present preparing a revision of the British inquiline *Cynipidæ* (*Synergus*), and should feel very much obliged to any one who would lend me for examination, bred specimens of this tribe.—*Id.*

Capture of Catocala fraxini in Berwickshire.—About the 9th of September, when sugaring near Netherbyres for *Cirrœdia xerampelina* (of which I only got one worn specimen); I was very much surprised to see one of this rare moth also. It was sitting with the fore wings arched upward, touching each other at the tip, and the hind wings spread backwards and pressing against the tree, giving this moth a most peculiar-looking appearance. Both the hind wings were badly torn, but the front wings were pretty perfect. There are plenty of old ash trees near, and the banks of the Eye are wooded for about three miles upward, so that it may have been bred further up, but none were taken in the neighbourhood of Ayton, though the trees were sugared in likely places.—W. Shaw, Eyemouth Mill, Ayton, Berwickshire, December, 1876.

Catocala nupta.—About the end of August, when sugaring on our sea-banks, I captured a fine specimen of this moth. There were several willow bushes not far from the place, on which the caterpillars most likely fed. The same ground was sugared twice afterwards, but they were not good nights, and no more *nupta* were taken.—*Id.*

Pachnobia hyperborea, var. alpina.—It seems desirable that some notice should be taken in the *Scottish Naturalist* of the occurrence in Rannoch last summer of numerous examples of this hitherto rare moth. Eight specimens which I had the pleasure of examining were remarkable for their beauty and variability. Careful searching in favourable years would probably show that this species is of wide distribution on our higher mountains.—F. Buchanan White.

PHYTOLOGY.

SCOTTISH GALLS.

By JAMES W. H. TRAIL, M.A., M.B., F.L.S.

I RESUME this subject in order to make some additions to galls described by me in Vols I. and II. of the *Scottish Naturalist*. During the past year I have found a few additions myself, and have had others sent me by Dr. Buchanan White, from near Perth chiefly; and in regard to some of those already described I have been enabled to determine the makers.

In the "Transactions of the Glasgow Society of Field Naturalists," are interesting and valuable papers on the gallmakers of the Glasgow district; the Hymenoptera being treated of by Mr Cameron, the Diptera by Mr Binnie. Both gentlemen have described several galls that I have not myself met with.

EROPHILA VERNA L.—Galls on this plant were sent me by Dr. Buchanan White in spring. They are oval or roundish swellings on the stem, just below or in the midst of the rosette of leaves, about 1/8 or 1/6 inch in diameter. On section the walls are found to be rather hard, and thin, and the cell is found to be occupied by the larvæ of a weevil, probably *Ceuthorhynchus drabæ* Lab. The gall is very inconspicuous, and will probably be found to be rather common and widely distributed.

STELLARIA HOLOSTEA L.—In various places near Aberdeen, in autumn. The tips of the shoots are often somewhat swollen, and the pseudogalls are found to consist of the closely imbricate leaves, which are hard, slightly fleshy, semiconduplicate, and yellowish-green. Between and within the leaves, live many Aphides, but I have not been able to determine the species.

ACER PSEUDOPLATANUS L.—From the upper surface of the leaf project 'nailgalls,' cylindrical or dilating upwards, about $\frac{1}{8} \times \frac{1}{16}$ inch, externally bright red and naked. On the lower surface of the leaf are found small pits, in the centre of each of which a gall opens by a small hole nearly blocked up with projecting transparent simple hairs. On section the interior is found to be smooth above, or covered with minute warty tubercles. Galls examined in July showed multitudes of the makers, viz., a species of *Phytoptus,—Ceratoneon vulgare* Bremi, = *Volvulifex aceris* Amerling. The galls are common at Banchory on Deeside, at Perth, and at Glasgow. Usually multitudes occur on each leaf.

TRIFOLIUM REPENS L.—(*Sc. Nat.* I. 195) The galls already described as found on this plant are the work of *Cecidomyia trifolii* F. Löw.

PRUNUS COMMUNIS HUDS. *var.* SPINOSA L.—To Mr. Binnie I am indebted for galls on the leaves gathered near Glasgow, in September. They consist of a swelling which projects like a bladder from the lower surface of the leaf, and opens by a cleft along the midrib on the upper surface. They are about $\frac{1}{6}$ to $\frac{1}{3}$ inch long, and $\frac{1}{8} - \frac{1}{6}$ inch broad and deep. The walls are thin, and the central cavity large. The outer surface is green like the rest of the leaf. When the gall is large the leaf is sometimes reduced to a fringe along each side of the midrib. Mr. Binnie informed me that all he found were empty save one or two, but that these contained larvæ of a *Cecidomyia*.

POTENTILLA TORMENTILLA L.—*(Sc. Nat.* II. 97.*)* The gall is made by *Aulax (Xenophanes) potentillæ* Vill. Dr. Vice found a gall of this species near Aberdeen.

CRATÆGUS OXYACANTHA L.—*(a)* (*Sc. Nat.* I. 79). Galls of *Cecidomyia crataegi* Winn. *(b)* In many places throughout the country (Aberdeen, Perth, Glasgow, &c). The margins of the leaves along one or more of the lobes are revolute and thickened, forming tubes lined with hairs, among which live the occupants, viz., mites of the genus *Phytoptus*. The gall has been named *Erineum oxyacanthæ* by Persoon, and described as a fungus. I is very noticeable, being pale greenish-yellow in colour, and usually occurring in large numbers.

PIMPINELLA SAXIFRAGA L.—The gall described in *Sc. Nat.* I. 125, is the work of *Cecidomyia pimpinellæ* Löw.

HERACLEUM SPHONDYLIUM L.—The leaflets of the root leaves are folded and somewhat distorted, but without further change, and in hollows along the mid-rib lie several white larvæ of *Cecidomyia heraclei* Kalt? These galls are rather common near Old Aberdeen, and at Muchalls, in summer.

GALIUM APARINE L.—*(a)* On the stem either at a node, or at the apex. When at a node they usually include stem and branches in a mass about ¼—½ inch across, but without checking their growth; when terminal they may reach 1—1½ inches in diameter, and then consist of a mass of stunted and deformed branches, leaves, peduncles, flowers and fruits. The masses are green, but are covered with a whitish pubescence. On section they are found to be fleshy, and to enclose numerous cells, each tenanted by a larva of *Cecidomyia galii* Winn. Occur in hedges near Aberdeen, and at Banchory, in autumn. *(b)* The leaves, especially towards the apex of the stem, become circinate or involute along one or both margins, forming irregular tubes, which have a blistered look, and are yellowish-green externally. They are tenanted by multitudes of a species of *Phytoptus*. The diseased plants have a look about them readily recognisable even from a little distance. They are abundant in one locality on the Kincardineshire coast, and I have also seen them near Perth, and Glasgow.

GALIUM SAXATILE L.—(*a*) Galls similar in form and origin to those just described occur on this plant also. They are common in Orkney and near Glasgow. (*b*). The flowerbuds or fruits sometimes become swollen and inflated, reaching $1/16 \times 1/12$ inch in diameter, but remain inconspicuous. On section I found an irregular cavity tenanted by a few specimens of *Phytoptus*. The galls are rather scarce, near Aberdeen, in autumn.

CENTAUREA NIGRA L.—On this plant occur deformities of the ovary, very hard and woody, irregularly ovate, about $7/16 \times 3/16$ inch, externally brownish, and densely covered with short white hairs; each encloses a cell wider below, and opening by a small hole above, and is tenanted by one white larva, truncated in front, and strongly ringed, with the

first two segments dark brown and horny. The galls are most readily detected by *squeezing* the flower-heads between one's finger and thumb, as the flower-heads show no sight of their presence externally. The makers were easily reared in confinement, and proved to be *Trypeta solstitialis* L. Dr. Buchanan White sent me galls from Dunkeld, and I afterwards found them at Banchory.

HYPOCHŒRIS RADICATA L.—I have met with galls similar in origin and situation to those just described, but they are smallar (⅛ inch), and externally are marked with longitudinal muricated ridges, and the walls are thin. Each is tenanted by a larva of a species of *Trypeta*. They seem to be very scarce near Aberdeen, where I found them in the end of July. Dr. Vice has given me pithy swellings of the peduncles on this plant from North Wales; they may be looked for in Scotland also. The maker belongs to the Cynipidæ.

HIERACIUM SYLVATICUM L.—Near Aberdeen, on the Links, I have found on this plant galls of *Aulax hieracii* Bouché (= *H. sabaudi* Hart.) They are swellings on the stem quite like those on *H. boreale* Fries (*Sc. Nat.* I., 157.)

HIERACIUM BOREALE FRIES.—*(a)* = Galls of *A. hieracii* Bouché. *(b)* On the receptacle I have once or twice found at Banchory galls like those described from *Hypochœris radicata* in size (⅙ × ½—⅛ inch), in form, and in bearing longitudinal ridges, but the walls are thicker. Each is tenanted by a larva of *Trypeta*.

PLANTAGO LANCEOLATA L.—The galls described in *Sc. Nat.* II. 252, are made by *Mecinus pyraster* Herbst.

QUERCUS ROBUR L.—*(f) Sc. Nat.* I. 234. Mr. Taylor this spring found galls of *Cynips lignicola* Hart. (= *C. Kollari* Gir.) at Kingcausie, on Deeside, a few miles from Aberdeen. I am not aware that they have been recorded so far north in Scotland before. *(i) Sc. Nat.* II. 127. Dr. Buchanan White has sent me galls of *Aphilothrix radicis* Fab. from near Perth. *(k) Sc. Nat.* II. 171. On some oak-catkins, also sent me from Perth by Dr. Buchanan White, there occurred numerous galls of *Andricus amenti* Gir. *(v)* On the same catkins with the last mentioned galls, occurred others, usually solitarily or in pairs, also evidently developed from the stamens.

They differed from the galls of *A. amenti* in being more than twice as large, oval, or slightly obovate, and smooth externally, save that some presented a longitudinal furrow on one side. The walls are very thin. I could not find any of the makers, but they probably belong to the genus *Andricus*. (*w*) Galls of? *Aphilothrix solitaria* Fonsc. (= *Cynips ferruginea* Hart.) were sent me from near Perth by Dr. Buchanan White. They are axillary, sessile, surrounded at the base by leaf scales; ovate, about ¼ by ⅛ inch, terminated by a short cone, externally reddish-brown and wrinkled; the walls are rather thin As I have not reared the insect I am not sure of the correctness of my identification. Mr. Cameron has sent me galls of *A solitaria* from near Glasgow.

CORYLUS AVELLANA L.—In spring and early summer one may often find the buds of the hazel enlarged, forming round bodies ⅛ × ⅜ inch in diameter, and composed of enlarged and closely imbricate leaf scales, and abortive leaves, all covered with a dense coating of greyish-white transparent hairs, among which live multitudes of a species of *Phytoptus* (= *Calycophthora avellanæ* Amer). The galls are mostly at or near the ends of the twigs. They are common at Banchory.

BETULA ALBA L.—*(b) (c)* and *(d)* (*Sc. Nat.* II. 304.) and *(e)* have been described as fungi, under the names *Erineum roseum* Schultz, and *E. betulinum* Schum., and also in Greville's Monograph of the genus *Erineum* (Edin. Phil. Journ. vi. pp. 77, and 79 tab. iii. ff 9. and 16), under the names *E. betulæ* D.C. and *E. betulinum* Schum. They are patches of small vesicles situated in shallow depressions of the leaf, ⅛—⅓ inch across, usually appearing on the lower surface, and then white or yellowish (*E. betulinum* Schum.), less frequently on the upper surface, where they are purplish-red (*E. roseum* Schultz). The vesicles are very small, and stalked. Among them live multitudes of the mites (*Phytoptus*). I have found these galls wherever I have looked for them.

AGROSTIS CANINA L.—From a friend this summer I received a stalk of this grass bearing on the main axis towards its apex, just at a whorl of branches, an oval swelling, 1/12 × 1/16 inch, naked, nearly smooth, and purple externally; it opened by a small hole between the branches; the walls

were found to be fleshy, and to enclose a pretty large irregular cavity lined with transparent filaments and small warty tubercles. Examination of the dried gall showed no trace of inmates, but from its structure it is probably the work of mites (or of *Vibriones*?). It was found on Deeside a few miles from Aberdeen.

OBSERVATIONS ON THE RECURRENCE OF THE RARER FUNGI.

By Rev. JOHN STEVENSON.

IN an interesting account of the last Annual Meeting of the Woolhope Club at Hereford, Mr. W. G. Smith says, "It was specially remarked how the species which were formerly abundant upon the charcoal heaps were now totally absent, their places being apparently filled by other species. This is remarkably the case in the instance of *Agaricus carbonarius*, a species only recently discovered in Britain; at first very rare, soon everywhere excessively common, and now apparently gone. The same observation holds good with *A. clavipes*." *

This observation is worthy of more than mere passing attention on the part of Mycologists. It can scarcely be accounted for by any of the ordinary conditions of soil or influences of climate. Other causes must be sought for in explanation. Given the same conditions of soil, moisture, and temperature, it will be found that the development of species varies so much from season to season, that their appearance or non-appearance can hardly be attributed to these influences alone. They are, at least, not sufficient to account for the disappearance of species. If I am asked, "What cause, then, do you assign for this?" I cannot answer the question; but it is to be hoped that the extremely interesting researches of Mr. Worthington Smith, on the reproductive processes in Fungi, may yet cast light on this, as on other unsolved problems in Mycology. When once found, most flowering plants may be looked for with certainty in the same localities, if they have not suffered extermination, as some of our rare Scottish plants have, at the hands of thoughtless students, or of greedy nurserymen. It is not so with the

* *Gardeners' Chronicle*, Oct. 7, 1876.

larger Fungi. They are much more variable—the rarer species at least—in their recurrence. In confirmation of this, I may quote the opinion of the Rev. M. J. Berkeley, regarding *Agaricus storea*:—"It is considered very rare by Fries; but it is probably one of those species which are abundant in some one year, and are not found again for a generation." *

Regarding *Ag. storea*, I may mention that Mr Worthington Smith, who exhibited it at South Kensington in 1873, identified it at the Perth Fungus Show in 1875. The same plant had been found previously by the Rev. J. Keith, who has drawn my attention to the following facts:—The plant which Mr Worthington Smith identified at Perth, as *Ag. storea*, was fasciculate; while Fries, both in his "Monographia," and "Epicrisis," describes it as "*solitarius*." In the last edition of his "Epicrisis," however, the expression "solitarius" is omitted. Otherwise, the description in "Hymenomycetes Europæi" is *verbatim* that of the first edition. †

Ag. carbonarius was gathered in Morayshire, by the Rev. J. Keith, in October, 1870, and again in October, 1871. He has not, however, noticed it since. It occurred on a spot in a fir wood, recently cut down, where a quantity of brushwood had been burned. *Ag. clavipes* has been recorded in various localities in the north-east of Scotland. My first acquaintance with it was in 1875, in company with Mr. Worthington Smith, who gathered it at Moncreiffe; and during 1876 I found it twice in different counties. Dr. Buchanan White informs me that it occurs in the neighbourhood of Perth, and in Rannoch.

Ag. euchrous was found during one of the late excursions of the Woolhope Club. Of this Mr. Worthington Smith says—"It is a curious fact, that for three years in succession a single plant of this handsome species has been found at Dinmore, each year in a different stump. Though rotten stumps abound at Dinmore, no amount of searching ever leads to the discovery of a second specimen of *A. euchrous*." ‡ I was fortunate in gathering this beautiful species at the same time, along with Dr. Buchanan White, during one of the excursions of the Cryptogamic Society at Killin. Three specimens attached

* *Annals and Magazine of Natural History*, Jan., 1875. "Notices of British Fungi," No. 1418.

† See concluding note. ‡ *Gardener's Chronicle*, Oct. 7, 1876.

were growing on a rotten stump; but farther search failed to detect others.

Of our new Scottish species, the most regular in its recurrence of those which have come under my own observation is *Lentinus scoticus*. It was first discovered by the Rev. M. L. Anderson in 1872, but remained undetermined till the following year, when it was forwarded to the Rev. M. J. Berkeley. In the locality in which I then found it I have gathered it regularly, though never in abundance, every year since; and during the past autumn I got it in a new station, where it was growing on fallen spruce fir branches. Previously it was found by Mr. Anderson on decayed *Ulex*, and by myself always on birch.

Of species recently added to the British Flora, some have as yet been regular in their appearance, while others have been noticed once, or, at most, twice. The observations of others will doubtless confirm the experience afforded by such examples as the following:—

Since July 1873 I have found *Ag. nummularius* regularly every season in the same locality and at the same time. It continues till October. I have never seen it except on the same spot.

For three years in succession, in September 1874 and 1875, and in October 1876, I have found *Cortinarius sebaceus* in the same place.

Ag. maritimus, discovered in September 1874, has since been recorded in various localities in Scotland. I have seen it only twice. Dr. Buchanan White notes it as common in Rannoch.

In September, 1874, *Leotia circinans* was growing in abundance in one locality. The most careful search has failed to detect it since. Numerous specimens of *Clavaria Krombholzii* appeared, during 1874 and 1875, in two stations not far apart; and, in September 1875, I found a single specimen at Moncreiffe, which was exhibited at the Perth Fungus Show. It has not appeared in the original stations during 1876.

For two successive seasons, September 1874 and 1875, I found numerous specimens of the rare *Ag. caput-Medusæ* in a small Scots-fir wood; but last year it had disappeared. While referring to this plant, I may mention that in October last I discovered *Ag. scobinaceus*, a species similar to, yet very distinct from, *Ag. caput-Medusæ*. Shortly afterwards I found, in a different locality, a large cluster of a plant which I could

not refer to either, but which combined some features of both. On submitting it to Mr. Berkeley, he pronounced it to be exactly intermediate between the two.

Cortinarius claricolor appeared in September 1875 in ground which I had searched carefully for years. It is scarcely possible that I could have overlooked such a striking plant had it existed there previously. I gathered it the same year at Moncreiffe; and during the past season, besides finding it in the original station here, I have gathered it at Kippendavie and at Killin. It remains to be seen whether a fate, similar to that which has befallen *Ag. carbonarius*, is in store for it.

Of older species mention may be made of *Ag. cucumis*. In his account of the Hereford meeting referred to above, Mr. Worthington Smith speaks of it as "uncommon." It seems to be more frequent in Scotland than in England. In a district where I could scarcely have failed to note it, I picked up a single small specimen two years ago; but during the past autumn, in various localities—all familiar ground previously—I found it growing in abundance. Similar examples might easily be multiplied.

The foregoing remarks on the variableness in the recurrence of species apply also to genera, though on the wider ground the influence of seasonal changes becomes more intelligible.

During 1875 I observed in the cases of *Corticia* and *Polypori* —especially resupinate *Polypori*—a very marked diminution as compared with previous years. The same is to be noted of *Peziza* during 1876. At Hereford, *Clavariæ* seem to have been totally absent. Both in England and Scotland, during the past season, *Cortinarii* have not been nearly so numerous as usual.

On the whole the year past has been an unfavourable one for the Mycologist. *Hymenomycetes*, especially, were late in making their appearance—partly, doubtless, owing to the drought of the early summer; and some genera were very poorly represented, when compared with previous years. Unfavourable, however, as the season has been, some additions have been made to our Flora. But I must not anticipate the reports of Messrs. Berkeley and Broome in the "Annals and Magazine of Natural History," where these additions will be duly recorded.

NOTE.—In the identification of the rarer Fungi, I am not inclined to regard "solitary," "cæspitose," and "fasciculate," as descriptions to which

much weight is to be attached. I have referred to *Ag. storea* described by Fries as "*solitarius*," but fasciculate when identified by Mr. Worthington Smith. Two species mentioned above may also be cited as examples. *Ag. euchrous* has been found at Dinmore only in single specimens. The three specimens which I found at Killin were so attached that the plant might be described as, at least, sub-cæspitose. It is characterised by the Rev. M. J. Berkeley, in his "Outlines of British Fungology," as "cæspitose," while, in his "Hymenomycetes Europæi," Fries says —"Equidem semper legi solitarium; ex auctoribus cæspitosus." *Ag. caput-Medusæ* I have gathered both solitary and, as described by Fries, "sub-cæspitose." *Ag. scobinaceus* was decidedly fasciculate, while Fries describes it as "sub-cæspitose;" and the plant, which was exactly intermediate between the two, was exceedingly fasciculate. Generally, the descriptions may hold good; but they are scarcely to be regarded as of much importance in cases of difficulty.—JOHN STEVENSON.

CRYPTOGAMIC SOCIETY OF SCOTLAND.

FROM the great scarcity of Fungi, as well as from other reasons, the Council of this Society determined not to have any public show in 1876, but to meet in some district which seemed likely to repay exploration, and there hold the Second Annual Conference.

Killin was accordingly selected as the meeting place, and a very pleasant gathering took place there on September 26 and following days. Fungi were very scarce, but, by diligent searching, specimens enough were found to make the meeting not altogether unprofitable.

Of *Hymenomycetes*, 166 species were found and determined, including the rare *Omphalia pictus* Fr. and *Leptonia æthiops* Scop., two species new to Britain, which were sent by the Rev. J. Stevenson to Mr. Berkeley, and *Mycena plicosus* Fr., an unrecorded British species, which, however, had been found near Perth the previous year. Among other notable *Hymenomycetes* were the beautiful little *Mycena pterigenus*, not uncommon on dead fern stems, with *Pistillaria puberula*; *Leptonia euchrous*, of which one or two specimens were found on a stump in Glen Lochay; *Cortinarius claricolor*, Glen Lochay (and Kippendavie, near Dunblane). *Hygrophorus cinereus*, *Boletus cyanescens*, *Polyporus giganteus*, *P. intybaceus*, *Hydnum udum*, *Phlebia merismoides*, *Odontia fimbriata*, *Clavaria amethystina*, *C. pistillaris*.

Of other Fungi may be mentioned—*Ustilago utriculosa*, *Puccinia chrysosplenii*, *Phyllactinia guttata*, *Geoglossum viride*, *Peziza badia*, *P. Schumacheri*, &c.

Several other Cryptogams were noticed, including *Habrodon Notarisii*, on trees at Finlarig.

At the Business Meeting it was resolved to alter the constitution of the Society, so far as related to a public show being held every year. In future the public show will take place at intervals of three or four years, and in such places as shall be deemed suitable. By this alteration of the laws, freedom is given to the Society to have its Annual Conference in localities where a pleasant exploration meeting may be held, but in which a public show would be impossible.

The following papers were read :—

1st, "On the Structure of the Hymenium of the Common Mushroom," by Mr. W. G. Smith, F.L.S.

In this paper Mr. Smith pointed out that Professor Sachs is wrong in stating that the basidium of the common mushroom produces two spores only, and not four, as all other agarics do. Four are produced, but usually only two at a time ; and it is only rarely that more than two may be seen *in situ* at the same time. We will publish this paper in full, with illustrations, in our next number.

2nd, "On the Geographical Distribution of Fungi in Scotland," by the Rev. J. Stevenson.

In laying his lists on the table, Mr. Stevenson said—

At our last annual meeting I laid before you a list of Fungi north of the Tay, and I then promised to supplement it by a similar list, embracing the plants which had been recorded for the Flora of the south.

When I made this promise, I meant to fulfil it literally. But I find that, with the accumulation of materials, my own ideas of what we might not unprofitably attempt have become somewhat enlarged. And I now contemplate preparing lists which may in some measure form a guide to the Mycology of Scotland. By such a guide I think we may supply a want, and at the same time offer a contribution to the more general subject of the geographical distribution of Fungi. The lists, therefore, which I am now preparing embrace the whole of Scotland.

I shall not detain you longer than to indicate by a brief analysis what we may aim at in preparing such a guide.

In addition to the general arrangement and classification, I propose, after the names of species, to give references to such authorities as may furnish the necessary information regarding their history and identification. I shall then notice their habitats, the seasons of their appearance, and the altitudes of their growth. This will be followed by a record of localities, and of authorities for these localities.

Looking to these details, I have not been able to accomplish more this year than a record of *Hymenomycetes*. The remaining portion of the lists contain simply the names of species. But I hope by another year to lay these also before you in detail. And I trust that the course of another year may find the entire list greatly enlarged.

My lists at present contain 2,316 species—about two thirds of the whole British Flora—and these have been gathered in counties ranging from Inverness in the north to Ayr in the south, and from the east to the west coasts.

Taking these counties in two divisions by a line drawn down the centre of Scotland from north to south, or, better perhaps, in three divisions, embracing the west and east coast and the central counties, we have already, I believe, very fair types of the Mycological Flora of Scotland. It remains to be seen what may be developed in the extreme northern and southern divisions.

It may be interesting to note, that since the publication of the latest British Work—"Cooke's Hand-book of British Fungi," Scotland has added to the British Flora no fewer than 168 species. Of these 58 are species new to science, and 110 new to Britain.

Of *Hymenomycetes*, where doubtless we have the most limited field for the discovery of new species, we have no fewer than 17 new to science, while 76 have been recorded as new to Britain. Of the other families we have to record 41 new species, and 34 new to Britain. And I may add, as showing that we are not likely to prove an useless corporation, that of these 168 species, 154 have been added to the British Flora by those who are at present office-bearers of the Cryptogamic Society of Scotland.

Turning to the first part of the list, which embraces *Hymenomycetes*, I have followed the classification and arrangement of

Fries, in the last edition of the "Epicrisis." This, I conceive, must now be our guide. And in some respects this classification differs from that which was adopted by Cooke in his Hand-book.

Passing over differences which relate merely to the arrangement of Synonyms, it may be interesting to notice the following:—

In Cooke's Hand-book, Inocybe is included as a section of Hebeloma, in accordance with views previously expressed by Fries. Fries, however, now regards them as distinctly separate. Indeed, although he retains Inocybe as a separate sub-genus of Agaricus, the characteristics appear sufficiently well defined to constitute a separate genus between the Agarici and the Cortinarii. Of this he says, "Grex quam maxime naturalis hoc loco intruditur inter species nullo modo affines. Melius igitur Inocybes sine dubio sisterent genus distinctum, inter Cortinarios et Agaricos medium, sed desunt adhuc characteres."

The sub-genus Deconica of Smith remains Psilocybe of Fries.

The separate genus Lepista of Smith has not been adopted by Fries.

In a note to the genus Lepista of Smith, Cooke says,—

"The three British species included in this new genus, were formerly classed by Fries with the sub-genus Tricholoma, but removed by him in his latest work to Lepista, as a sub-genus of Paxillus. We have followed Mr. W. G. Smith in his arrangement recently proposed in "Seemann's Journal of Botany," but not without some hesitation in separating Lepista from Paxillus, and giving it a generic position."

In the last edition of the "Epicrisis," Fries retains the three species of Smith's Lepista (L. nuda, L. cinerascens, and L. personata), in the sub-genus Tricholoma.

The genus Hymenochæte, does not appear in the "Epicrisis" of Fries. And the the three species of this genus, which were formerly regarded as Thelophoræ, are classed by him under Stereum.

Referring to species which appear under different genera, the following may be noted:—

Ag. (Clitocybe) maximus of Sowerby, in regard to which there have been differences of opinion, has been removed by Fries to Paxillus, and is now Paxillus giganteus. I have this year found the plant, and an unmistakeable Paxillus it is.

Ag. (Galera) reticulatus, as figured in Berkeley's Outlines,

appears in the last edition of the "Epicrisis" under a separate sub-genus—Pluteolus.

Ag. (Galera) embolus of Berkeley's Outlines is Ag. (Tubaria) embolus of Fries.

Ag. (Hypholoma) hydrophilus is Bolbitius hydrophilus of Fries.

Cortinarius caperatus of B. and Br. appears as Ag. (Pholiota) caperatus in the "Epicrisis."

Polyporus cervinus of Berkeley's Outlines is Trametes mollis of Fries.

The following also are worthy of note :—

In his Hand-book Cooke identifies Gomphidius stillatus of Strauss, with Gomphidius gracilis of Berkeley's Outlines, having G. gracilis as a mere synonym. In the "Epicrisis" Fries identifies G. stillatus with G. maculatus, while he retains Berkeley's G. gracilis as a separate species.

Hyphelia rosea, which was lately found by Mr. Fergusson, and recorded by Berkeley and Broome, has been regarded as new to Britain. Fries identifies it with Corticium roseum, which was previously well known as a British plant.

In regard to the two following species I simply raise questions :—

Ag. (Clitocybe) gilvus of Persoon appears to me from the references to have been gathered by Greville. It is recorded in his "Flora Edinensis," and should have been recorded in Cooke's Hand-book.

Ag. (Collybia) clavus of the English Flora is Ag. (Mycena) acicula. But from the references it seems to me that Greville's Ag. clavus, recorded in his "Flora Edinensis," and cited in the English Flora, is the same as Ag. clavus of the last edition of the "Epicrisis" of Fries.

ON UREDO FILICUM DESM. & UREDO? PTERIDUM *N. SP.*

By F. BUCHANAN WHITE, M.D., F.L.S.

SOME time ago, I received from the Rev. J. E. Vize, specimens of a fungus parasitic on *Scolopendrium vulgare*, with the name *Uredo filicum*, Desm. These did not agree in appearance with the fungus parasitic on *Cystopteris*, which I

had been in the habit of considering *U. filicum*, but as I had mislaid my specimens of the latter I was not able till lately to compare the spores. Having done so, I find that they are very different, and that two species have been confounded under the name *U. filicum*.

Being under some doubt as to which was the original plant of Desmazieres, I wrote to the Rev. M. J. Berkeley, who with his usual kindness replied, "Desmazieres' plant is on *Cystopteris*. Your new species must be that on *Scolopendrium*. It is probably the uredo spores of a *Puccinia*, which has hitherto occurred in such small quantities, that it has not been published."

The two species may thus be distinguished.

UREDO FILICUM Desm.

Sori hypogenous, subrotund, bullate; epidermis at length ruptured; spores subglobose, yellow; epispore smooth. Length of spores .0075—.01 inch.

On fronds of *Cystopteris fragilis* and *C. dentata*. Probably common. Ascends to 2,700 feet, on Ben Lawers.

UREDO? PTERIDUM n.sp.

Sori hypogenous, subrotund, bullate; epidermis not ruptured (?); spores oblong oval, yellowish; epispore distinctly papillose. Length of spores .015—.0175 inch.

On fronds of *Scolopendrium vulgare*. Forden, N. Wales (Rev. J. E. Vize).

The shape and structure of the spores, as well as their much larger size, at once separate this from *U. filicum*, which otherwise it rather resembles. Should it prove to be the *Uredo* state of a *Puccinia*, the name will be *Puccinia pteridum* In my copy of Dr. M. C. Cooke's "Fungi Britannici," 2nd edition, the specimen (No. 73) with the name *Uredo filicum* Desm., is *U.? pteridum*, but the spores figured are apparently those of *U. filicum*.

Perth, Dec., 1876.

NEW OR RARE LICHENS.

By J. STIRTON, M.D., F.L.S.

THE following new and rare lichens were gathered in 1874 by Mr. R. H. Paterson of Glasgow on or near Ben Brecht, Argyleshire:—

Physcia chrysophthalma L.
Squamaria chrysoleuca Sm.
Squamaria lentigera Web.
Placodium fulgens Sw.
Lecanora alphoplaca Whlmb.
var. *melanaspis* Ach.
Lecanora rubra Ach.
Pertusaria velata Turn.

Pertusaria reducta n. sp.—Thallus cinerascens vel cinereo-fuscescens tenuis rimuloso-areolatus (K fl. dein intense rubens); apothecia sessilia, in verrucis thallinis monocarpis inclusa, fusca vel rufo-fusca, lecanorina (latit. .3-.5 mm.) cæsio-pruinosa; thecæ monosporæ, sporæ incolores vel vetustæ nonnihil fuscescentes, oblongæ, .09-.14 × .03-.04 mm.; paraphyses confertæ, sat distinctæ, nonnihil anastomosantes. Iodo gel. hym. cærulescens, praesertim thecarum.

Corticola.

The younger spores have a broadish epispore, while the mature have coarsely granular contents. Perhaps this is too closely allied to *P. multipuncta* (Turn.), but, as the open lecanoroid state described by Nylander (Scand. p. 180) has been referred to a distinct species, under the name *P. ophthalmiza*, with reactions of thallus K-- C—, the present has been separated from it.

Lecidea polysita n. sp.—Thallus cinereus vel pallide cinereo-fuscescens, crassiusculus (K— C—), squamulosus vel squamuloso-concretus, squamulis crenulatis et interdum concaviusculis; apothecia sessilia, fusca vel fusco-nigra, planiuscula immarginata, demum convexa et prominula, (latit. .4-1.3 mm.); sporæ 8næ aciculares vel nonnihil bacillares, rectæ, 3-11-septatæ, .045-.07 × .003-.004 mm.; paraphyses distinctæ apicibus incoloribus non clavatis; hypothecium luteo-rufescens crassum, vel, in lamina crassa, fuscum vel nigro-fuscum, K purpurascens, etiamque pars infera hymenii. Iodo gel. hym. intense et persistenter cærulescens.

Ad corticem vetustum vel emortuum, prope Ben Brecht.

Lecidia soreumidia n. sp.—Thallus pallidus vel pallide cinereus, crassiusculus rugosus vel passim verrucoso-congestus, fusco-limitatus (K—C—); apothecia intus cinerascentia, conferta

sessilia, parva (latit. .3-.5 mm.), primum plana rugosa, marginata et cæsio-pruinosa, demum convexa, rugosa immarginata et sæpe connato-congesta; sporæ 8næ ellipsoideæ, fuscæ 3-septatæ et fere murali-divisæ, .013-.02 × .008-.0095 mm.; paraphyses non discretæ, nonnihil irregulares apicibus fuscis granuloso-inspersis; hypothecium fuscum vel fuscescens. Iodo gel. hym. intense cærulescens.

Ad ligna cæsia.

This lichen plays between *L. fecunda* and *L. plicatilis* (Leight).

Opegrapha constrictella n. sp.—Thallus albidus vel pallidus tenuis; apothecia intus pallide fuscescentia, nigra simplicia interdum aggregata, longit. .4-1.2 mm., latit. circ. .2 mm., epithecio lato concavo vel etiam explanato, perithecio laterali; sporæ 8næ incolores obovatæ, 1-septatæ, constrictæ, .012-.017 × .0045-.0065 mm.; paraphyses confertæ irregulares, non bene distinctæ apicibus fuscis (K sordide cærulescentibus); hypothecium incolor. Iodo gel. hym. non tincta.

Ad corticem vetustum.

In no instance have fuscous spores been detected, otherwise this species might be referred to the group of which *O. lentiginosa is the type.*

Melaspilea Patersoni n. sp.—Thallus albidus vel pallidus tenuis vel evanescens; apothecia nigra plana vel convexiuscula parva (latit. .15-.3 mm.); sporæ 4næ (an semper?) incolores aciculari-cylindraceæ, pluriseptatæ (circa 10-sep.), .04-.06 × .0025-.003 mm., fragiles; paraphyses filiformes, ramosulæ, apicibus intertextis obscuratis; hypothecium fuscescens vel pallidum. Iodo hypothecium leviter vel obsolete cærulescens, cæteroquin hymenium non tinctum, protoplasma thecarum fulvescens.

Ad corticem emortuum.

With one exception where there were five, only four spores have been detected in each theca, and they lie in a direction parallel to its length. The tendency to break up is very manifest when the thecæ are ruptured. The spores are then seen in fragments varying in length, either simple or containing 1-3 septa.

Decampia Hookerii Borr.

GLASGOW, December, 1876.

MARINE BIOLOGICAL LABORATORY WOODS HOLE LIBRARY

Convolvulus arvensis as an unintended ornamental climber.—This plant is not very common in this parish (Rattray), though a great nuisance to the farmers in the parish of Kinloch, three miles west from this. Early this spring, some shoots of it, whence come I do not know, showed themselves at the side of my front door. At first I thought it was *C. sepium*, but after it declared its specific distinction, it exhibited a character for which I was not prepared. Being close to an iron trellis, it quickly twined up the same, and is now there to the height of about eight feet, covering the trellis with a rich thick green mass more than two feet wide. The pale pink blossoms (two on a peduncle) were abundant in summer; and the leaves seem disposed to be evergreen, and the stems to stand the winter, as they were unaffected by the frost, which a fortnight ago was nine degrees F. below freezing point. Altogether, the plant, which was merely allowed to grow up because it appeared at a vacant place, has unexpectedly proved very ornamental. It has good soil.—W. HERDMAN, Rattray, Nov., 1876.

Note for Mycolologists.—In following out the subject of papers which have been read at the meetings of the Cryptogamic Society of Scotland, I am presently engaged in preparing lists of the Fungi of Scotland; and am anxious to avail myself of the aid of those who have directed their attention to this branch of Cryptogamic Botany. After the names of species, I purpose to give such references as may be useful to the student for botanical description, etc., and to note their habitats, seasons of growth, ranges of altitude, and geographical distribution—authorities, of course, will be quoted. In order that such a work may be as complete as possible, I take this opportunity of requesting the assistance of all who are interested in the subject; and will feel greatly obliged by any communications with which Mycolologists may favour me.—J. STEVENSON, Glamis, Forfarshire.

Rare Fungi from Glasgow Botanic Gardens.—Having made repeated visits to the various gardens in the neighbourhood of Glasgow for several years, I have had ample opportunity of observing the several forms of Fungi which appear from time to time in the pots and tanks of the hot-houses. Some of these forms are great pests to the gardener, and are with difficulty kept down; e.g., *Agaricus cepæstipes* and *Agaricus cristatus*, which are exceedingly common in the tan-pits of the Botanic Gardens. Among the rarer specimens are several never before observed in the west of Scotland; such as—(1) *Lepiota georginæ*. Sm. Known at once by its turning to a deep blood red or claret colour when cut or bruised. (2) *Pleurotus gadinioides* Sm.—A beautiful and delicate form, white in colour, growing on stems of *Dicksonia* in the Botanic Gardens. (3) *Agaricus echinosporus* Sm.—Growing on decayed wood in the new range of hot-houses in the Botanic Gardens. (4) *Polyporus xanthopus*. Fr.—This is a most beautiful form, resembling no other British fungus with which I am acquainted. The pileus is thin, like paper of a golden yellow colour, and very distinctly zoned. The pores are very minute, running down the stem. It was growing on a piece of wood used for an aerial orchis. (5) *Merulius himantioides*. Fr.—Growing on wood in the Botanical Gardens. Besides these, I have observed several other forms, which I have been unable to determine as yet.—R. H. PATERSON, 6 Windsor Place, Glasgow, December, 1876.

INSECTA SCOTICA.

THE LEPIDOPTERA OF SCOTLAND.

(Continued from Vol. III., p. 367.)

EDITED BY F. BUCHANAN WHITE, M.D., F.L.S.

BRUNNEATA. Thnb. (1784); *pinetaria* Hb. (after 1797). Local. Ericetal. Ascends to 1400 feet.

DISTRIBUTION—EAST. o o Tay Dee Moray ♀ o o
WEST. o o ♀ West-Ross ♀

LAT. 56°40′-57°40′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE.—IMAGO. July, August. LARVA. August, September. FOOD-PLANT. *Vaccinium myrtillus.*

ASPILATES Tr.

STRIGILLARIA Hb. Not common. Amongst broom, or ericetal.

DISTRIBUTION—EAST. ♀ ♀ Tay ♀ Moray ♀ o o
WEST. Solway Clyde o o o

LAT. 55°-57°40′. RANGE IN EUROPE. Central, &c. TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August-May. FOOD-PLANT. Broom (and heather?)

Scottish specimens are decidedly different from the only English one I have (which appears to be the usual form), being much more strongly marked, and, contrary to the usual rule, distinctly smaller.

The occurrence of *A. citraria* in Solway and Skye requires corroboration.

STERRHA Hubn.

SACRARIA L. Very rare.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o o

LAT. 56°40′. RANGE IN EUROPE. Southern (Britain, &c.) TYPE. Meridional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE. — IMAGO. July. LARVA. August. FOOD-PLANT. Dock and Wild Camomile.

Three specimens were taken in Rannoch, by Mr. J. Blackburn, in 1867. *Lythria purpuraria* L. has been reported from Tay, but certainly I think in error.

BOARMIIDÆ.

PSODOS Tr.

CORACINA Esp; *trepidata* Dup. (*non trepidaria* Hb.) Local. Alpine. From 2000 to over 3400 feet.

DISTRIBUTION—EAST. o Forth Tay Dee ♀ ♀ o o
WEST. o o Argyle ♀ o

LAT. 56°30′-57°. RANGE IN EUROPE. Alps and Pyrenees; Mountains of Scotland, Norway and Lapland, &c. TYPE. Alpine and septentrional. TYPE IN BRITAIN. Alpine.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. May. FOOD-PLANT. *Azalea procumbens?*

DASYDIA Gn.

OBFUSCARIA Hb. Very local. Ericetal. Ascends to 1400 feet.

DISTRIBUTION—EAST. o Forth Tay Dee ♀ o o o
WEST. o Clyde ♀ West-Ross o

LAT. 55°-57°40′. RANGE IN EUROPE. Alps, Britain, Sweden, Finland, &c. TYPE. Alpine and septentrional. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. September, June. FOOD-PLANT. Heather.

GNOPHOS Tr.

OBSCURARIA Hb. Local. Usually rupestral.

DISTRIBUTION—EAST. Solway Forth Tay o Moray o o o
WEST. Solway Clyde ♀ West-Ross o

LAT. 54°40′-57°40′. RANGE IN EUROPE. Central, Finland, &c. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE.—IMAGO. July, August. LARVA. September-June. FOOD-PLANT. Grasses, &c.

Very variable in colour in England but seems more uniform in Scotland, where the dark form appears to be the only one.

BORMIA Tr.

PUNCTULARIA Hb. Very local. Nemoral.

DISTRIBUTION—EAST. o o Tay ♀ ♀ o o o
WEST. o o Argyle ♀ o

LAT. 56°30′-56°40′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE.—IMAGO. May, June. LARVA. July, August. FOOD-PLANT. Birch and alder.

CREPUSCULARIA Hb. Not uncommon? Nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. ♀ ♀ Tay Dee ♀ o o o
WEST. ♀ Clyde ♀ o o

LAT. 55°40′-57°. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. English?

TIME OF APPEARANCE.—IMAGO. April, May. LARVA. August, September. FOOD-PLANT. Larch.

REPANDATA L. Abundant. Nemoral. Ascends to 1200 feet

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ West-Ross o

LAT. 54°40′-57°-40′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. April, May. FOOD-PLANT. Oak, birch, &c.

[ABIETARIA Hb. Rare. Nemoral.

DISTRIBUTION—EAST. o Forth o o o o o
WEST. o Clyde o o o

LAT. 56°20′. RANGE IN EUROPE. Germany, Switzerland, Belgium, Britain, East France, &c. TYPE. Occidento-central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE.—IMAGO. July. LARVA. May, June. FOOD-PLANT. Fir.

Having seen no specimens, I prefer in the meantime to consider this as a rather doubtful inhabitant of Scotland.

GEMMARIA Brahm. (1791); *rhomboidaria* Hb. (after 1797). Rare.

DISTRIBUTION—EAST. Tweed ⊗ Tay o o o o o
WEST. Solway Clyde o o o

LAT. 55°-56°-30′. RANGE IN EUROPE. Central and southern. .TYPE Centro-meridional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August, September. FOOD-PLANT. Oak, plum, &c.

CINCTARIA Schiff. Rare.

DISTRIBUTION—EAST. o o o o o o o o o
WEST. o o Argyle o o

LAT. 56°30′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. September. FOOD-PLANT. Heather.

Amongst alders at Dalmally—Mr. Buxton.

CLEORA Curtis.

LICHENARIA Hufn. Not uncommon. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ⊗ ⊗ o

LAT. 54°40′-57°40′. RANGE IN EUROPE. Central (Sweden, &c). TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July. LARVA. September-May. FOOD-PLANT. Tree lichens.

C. glabraria has been reported from Solway and Clyde, and *C. angularia* Thnb. *(viduaria* S.V.*)* from Tay, but both seem to me to require corroboration.

HYBERNIIDÆ.

ANISOPTERYX Stph.

ÆSCULARIA Schiff. Local. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. Solway Clyde o o o

LAT. 54°50′-56°30′. RANGE IN EUROPE. Central (Sweden?) TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. February-April. LARVA. May, June. FOOD-PLANT. Ash, privet &c.

(To be continued.)

THE COLEOPTERA OF SCOTLAND.

(Continued from Vol. III., p. 376.)

EDITED BY D. SHARP, M.B.

OPACA Lin. Rather common.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o

WEST. Solway Clyde o o o

QUADRIPUNCTATA Lin. Very rare.

DISTRIBUTION—EAST. o Forth Tay o Moray Sutherland o o

WEST. o o o o o

NIGRITA Creutz. Not common.

DISTRIBUTION—EAST. ♀ ♀ Tay Dee o o o o

WEST. Solway ♀ o o o

TRISTIS Ill. Rare.

DISTRIBUTION—EAST. o Forth o o o o o o

WEST. Solway o o o o

[OBSCURA Lin. Doubtful as Scottish.

DISTRIBUTION—

"Not common but generally distributed." Murray Cat.

ATRATA Lin. Abundant. Lowland, highland.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray ♀ o o

WEST. Solway ♀ ♀ o o

SPHÆRITES Lac.

GLABRATUS Fab. Rare. In decaying fungi, and at oozing sap.

DISTRIBUTION—EAST. Tweed o Tay Dee o o o o

WEST. o o o o o

CUCUJIDÆ.

DENDROPHAGUS Thoms.

CRENATUS Payk. Highland. Under bark of Scotch fir. Very local.

DISTRIBUTION—EAST. o o Tay Dee Moray o o o

WEST. o o o o o

SILVANUS Thoms.

SURINAMENSIS Lin. Imported, but sometimes found away from habitations.

DISTRIBUTION—EAST. o Forth o o o o o o

WEST. o ♀ o o o

BIDENTATUS Fab.

DISTRIBUTION—EAST. o o o o o o o o

WEST. o Clyde o o o

A single individual was found by Mr. Young near Paisley: it was probably an imported specimen.

NAUSIBIUS Thoms.

DENTATUS Marsh. An imported species found amongst groceries.

DISTRIBUTION—EAST. o Forth o o o o o o

WEST. o o o o o

CRYPTOPHAGIDÆ.

TELMATOPHILUS Thoms.

TYPHÆ Fall. Lowland, in marshes.

DISTRIBUTION—EAST. Tweed o o o o o o o

WEST. o o o o o

CARICIS Ol. Lowland, in marshes.

DISTRIBUTION.—EAST. o Forth o o o o o o

West. Solway o o o o

ANTHEROPHAGUS Thoms.

NIGRICORNIS Fab. Lowland, in flowers. Rare.

DISTRIBUTION—EAST. o Forth o o o o o o

WEST. ꝏ Clyde o o o

The *Antherophagus silaceus* of Murray's Catalogue, is no doubt the above species.

PALLENS Ol. Rare.

DISTRIBUTION—EAST. Tweed Forth o o o o o

WEST. Solway o o o o

CRYPTOPHAGUS Er.

SETULOSUS Sturm. Lowland, highland. Common.

DISTRIBUTION—EAST. ꝏ Forth ꝏ Dee ꝏ o o

WEST. Solway ꝏ o o o

The *C. lycoperdi* of Murray's Catalogue is no doubt this species.

PILOSUS Gyll. Common.

DISTRIBUTION—EAST. ꝏ Forth Tay ꝏ ꝏ o o

WEST. Solway ꝏ o o o

(To be continued.)

ZOOLOGY.

ON THE OCCURRENCE OF *PORPHYRIO SMARAGDONOTUS* TEMM.

By COL. H. M. DRUMMOND HAY, C.M.Z.S.

IT may be interesting to record the fact of *Porphyrio smaragdonotus* Temm. (*P. chloronotus* Brehm.) having been shot on the Tay last autumn by a young man resident in the village of Errol, who tells me that about the 15th September, while shooting wild-ducks by moonlight on the banks of the Tay, between Errol and Seaside, he was watching at the end of one of the stone dykes which stretch far out into the river, when his dog, which was poking about among the high reeds, started a bird which flew past him, and which he fortunately shot. Some little time afterwards the bird was shown to me, it having then been skinned and mounted. From the description I had previously got of it, I believed that the bird would turn out to be *Porphyrio hyacinthus* (Temm.) (*P. veterum* Gml.), an occasional straggler to this country; it having been, I believe, noticed more than once in England, while one is recorded by Mr. R. Gray in his "Birds of the West of Scotland" p. 337, as having been shot near Campbeltown, Argyleshire, in September 1876. *Porphyrio hyacinthus* I am well acquainted with, having so often seen it in Sicily, where it frequents the marshes in the neighbourhood both of Catania and Syracuse; but to my great surprise the bird brought to me proved to be *Porphyrio smaragdonotus*, which I believe to be more an eastern species than the former,*

* *Porphyrio hyacinthus* is mentioned by Temminck and other authors as inhabiting the Ionian Islands, Greece and Turkey. Having been for some years resident in the Ionian Islands, and through most parts of Greece and Turkey, I may state, that though frequently searched for, I have never seen it east of Sicily.

having seen no notice of its occurrence in northern Africa or any part of western Europe. Professor Newton, however, in a letter to me lately, has drawn my attention to its occasional occurrence in the south of Europe, one having been shot in Sicily (Ibis 1870, p. 454) and six live examples taken in the south of France, on the authority of Baron J. W. Von Müller.

On comparing the specimen in question with a pair of Sicilian Purple Water Hens, *P. hyacinthus*, in my possession, I find it to be smaller, and much brighter in plumage; unfortunately no note was taken of the sex, but I believe it to be an adult male in full plumage. Very possibly it may have escaped from confinement, though it had no appearance of having done so, but this of course, after being at large for a certain time would be lost.

Dr. Wylie, of Errol, tells me that about thirty years ago he shot (nearly in the same spot as the above) a bird of similar appearance, with deep red legs and frontal plate, but he could not be certain of the species as the bird was not preserved.

I may remark that from the great extent of the reed beds on the tidal parts of the Tay, a bird of so shy and retired habits as the *Porphyrio*, which is most difficult to flush, might easily escape detection, and may even have been of more frequent occurrence.

Seggieden, March, 1877.

THE LEPIDOPTERA OF MONCREIFFE HILL.

By Sir THOMAS MONCREIFFE, Bart.

IT has been suggested to me by the editor of this Magazine that, from its central position in Scotland, and from the rather rich and varied nature of its productions, some account of Moncreiffe Hill and its Lepidopterous inhabitants might not be void of interest and instruction.

The district of which I purpose giving an account comprises in reality only part of the hill, the greater portion of the northern slopes having been as yet only partially examined. Lying between 56° 21′—56° 22′ N. Lat., and 3° 22′—3° 25″ W. Long., it is in area about one square mile, and varies in altitude from 30

to 725 feet above sea level; the north-east boundary being a ridge of from 200 to 700 feet in height. More or less immediately to the southwest of the northern boundary there is an abrupt descent (in many places formed by precipitous rocks) followed by a more gradual but still very steep decline to about 100 feet above sea level, and then a gentler slope to about 30 feet on the southern boundary of the area. The ridge, which varies considerably in width, and the abrupt slopes (except where these are not actually rocky precipices), are more or less thickly wooded, all the various indigenous leaf trees and the usual coniferous trees being represented, with here and there a considerable undergrowth of heather, blaeberry, broom, furze, or bracken. The other plants include all those common to this part of the country, with a sprinkling of more local and rarer species. From 100 feet downwards there are the usual cultivated fields intermixed with plantations and permanent pasture, and including Moncreiffe gardens and shrubberies.

Geologically the hill is eruptive trap of the Old Red-sandstone, the lower grounds being covered with alluvial deposits of the usual nature.

I shall now proceed to enumerate the species which inhabit the district, at the same time indicating their distribution therein.

DIURNI.

The butterflies are not numerously represented in species and call for few remarks.

Pieris Brassicæ, *Rapæ*, and *Napi* are all numerous along the base, and flit about in great numbers up to 200 feet, above which *Brassicæ* is seldom seen, and all become less numerous as one gets further from the gardens, although the two latter are to be met with to the top.

Anthocharis Cardamines is not very common, and I have never observed above half-a-dozen in a season.

Pararge Egeria.—I have only taken two or three specimens of this butterfly at Moncreiffe, and cannot discover that it has been a common insect here.

P. Megæra I have only observed two or three times since I commenced collecting, but Mr. Herd tells me that it was formerly a common insect about Moncreiffe. Why this should be so I am unable to form any opinion, as the grass parks round about the house where it is said to have abounded are in much the

same state as they were forty years ago. It is one of those unaccountable cases which have been often noticed by entomologists, that insects disappear for no visible reason, and, as often happens, may reappear as commonly as formerly at some future time.

Satyrus Semele is to be met with along the rocky faces, at an altitude of 400 feet and upwards, from one end of Moncreiffe Hill to the other. It visits the lower part of the hill occasionally, but its habitat is among the bare faces towards the summit. I have not observed any variations in size or markings.

S. Janira is common everywhere, and although I have taken specimens that vary slightly in the ground colour, I think it is to be attributed more to the effects of the weather than to any variation in the insect.

S. Hyperanthus.—Not an uncommon insect, though local. It is to be met with every season in the same localities in about equal numbers, but it varies considerably in size and in the number of the ocelli on the wings. I have four specimens now before me, varying as follows :—

1st. Two ocelli on the superior wings and two on the posterior —the latter being slightly the largest.

2nd. Three on each of the superior wings, two on the posterior. The centre ones on the superior being considerably larger than any of the others, and the lowest one of the three being only a small black dot.

3d. Two distinct very small black dots on the right superior, on the left only one, in the right posterior none, in the left a very minute though perfectly clear ocellus.

4th. No ocelli on the two superior or on the right posterior, but a distinct though minute one on the left.

In No. 1, three out of four of the ocelli on the front wings have a white central spot, in the 4th it is absent, those on the posterior wings have all distinct white centres. In No. 2, eight of the ocelli have distinct white central spots, in the lower one of the three on each superior wing they are wanting. In Nos. 3 and 4, the white central spots are absent. In each case the outer circle is lighter than the ground colour of the wing, the inner one darker, and the central one pure shining white.

Cœnonympha Davus has been reported from Moncreiffe Hill, but I have not seen specimens, so shall pass it by unclaimed.

C. Pamphilus is common in every open space, and requires no comment.

Vanessa Cardui is scarce in most seasons—indeed since I commenced collecting in 1870, it has never been plentiful. On one occasion Mr Herd disturbed one early in spring out of a rabbit hole, the roof of which he broke down with his foot while clambering along the hill face.

V. Atalanta.—Not uncommon in some seasons, but cannot be called plentiful, although its food-plant is more than commonly so in the woods. As however the farmers do not allow it to exist on the sunny side of the fields, the shady situations where it is most prevalent may not suit this sun-loving insect as a nursery for its offspring. I can corroborate the love of *Atalanta* for old sugared trees, as I have seen five or six congregated on one which had been sugared two nights previously for noctuæ.

V. Antiopa.—One of these handsome insects was taken in my garden, which lies at the foot of Moncreiffe Hill, in October 1872. It had frequented the place during the month of September, and on one occasion I watched it sunning itself on the wall for five minutes, while a friend ran home for my net. It decamped, however, just as the net arrived, but was subsequently captured and brought to me. On the same day that that I first saw *Antiopa* at Moncreiffe, Dr. Buchanan White and Col. Drummond Hay saw one near Dunkeld. I cannot think that this fine insect breeds with us in the north, and I must confess it seems to me probable that the individual specimens which were scattered over Scotland in 1872 were the stragglers of a flight such as those of other butterflies which have been frequently met with in warmer climates, that have been blown across the channel to the south of England. If they bred with us more than single individuals would be seen together, and the larva would be observed.

V. Urticæ.—Common everywhere in the open places up to the summit. A specimen came in to the light in my study at 12.30 A.M. on August 5th, 1872. I was standing at the open window at the time, and saw it enter.

Argynnis Aglaia.—Local and uncertain in its appearance. Fairly common in 1870 and 1871, in one or two localities from 600 feet down to 100; since then, however, it has been scarce. The food-plant, *Viola sylvatica*, is very plentiful, and I cannot account for its absence since 1871, as I have noticed it in the colder climate of Blair Athole in undiminished numbers, though almost entirely absent here.

Thecla Quercus is common on Moncreiffe Hill, and also on plantations at its base, amongst oak trees. It is, however, not easy to obtain in good condition, as it usually frequents the tops of the trees. I have seen it swarming occasionally round the oak tops in fine weather, and have sometimes taken it at the blossoms of the ragwort. On one occasion I took a specimen at rest on the flower of that plant at night, when examining the heads for insects with a lantern.

T. Rubi.—In 1871, when I first noticed this pretty little butterfly, it was confined principally to one spot, amongst *Vaccinium* (bilberry). Since that time, however, it has spread over the whole of the hill wherever that plant grows, flying in the sunshine, and suddenly disappearing when the sky becomes clouded. In wet, cloudy weather, and at night, it rests upon the surrounding trees, and may then be beaten out of the branches, being specially partial to birch as a resting place. What the food-plant of the larva may be I cannot say, as few, if any, papilionaceous plants grow in the locality, and certainly little or no bramble.* Altitude about 600 feet, more or less.

Polyommatus Phlœas.—Common in all open spaces, and requires no comments. Varies slightly in shades of ground colour.

Lycœna Alsus.—Not common. I once took a specimen flying, or rather hovering, on the lee side of a sugared tree.

L. Icarus (Alexis).—Common, but more numerous in some seasons than in others. I have seen almost every buttercup in a field occupied by this pretty little insect, and in a few days not one would be left; probably they migrate according to the weather, or for other causes.

L. Artaxerxes.—Local and uncertain in its appearance. Never common, but usually to be obtained every season. I do not recollect having observed it except in two localities, one of which must be nearly 600 feet above sea level, and the other about 120. I have taken it usually after three o'clock in the afternoon. I have never observed the slightest variation in the markings of this insect.

Several other species (e.g., *Argynnis Selene* and *Euphrosyne*,) ought to occur here, but I have not yet observed them. Our list of butterflies, as will be seen, must be considered decidedly a

* I have always found this insect amongst *Vaccinium myrtillus*, on which the larva must surely feed. I am not aware, however, that it has been seen to do so.—Ed. *Scot. Nat.*

poor one, as it only comprises the following 21, out of 32 Perthshire species :

1. Pieris Brassicæ ; *c*
2. ,, Rapæ ; *c*
3. ,, Napi ; *c*
4. Anthocharis Cardamines; *r*
5. Pararge Egeria ; *r*
6. ,, Megæra ; *r*
7. Satyrus Semele ; *c*
8. ,, Janira ; *c*
9. ,, Hyperanthus ; *c*
10. Cœnonympha Pamphilus, *c*
11. Vanessa Cardui ; *r*
12. Vanessa Atalanta ; *f*
13. ,, Antiopa ; *v r*
14. ,, Urticæ ; *c*
15. Argynnis Aglaia ; *f*
16. Thecla Quercus ; *c*
17. ,, Rubi ; *c*
18. Polyommatus Phlæas ; *c*
19. Lycæna Icarus ; *c*
20. ,, Alsus ; *f*
21. ,, Artaxerxes ; *f*

NOCTURNI.

None of the *Zygœnidæ* occur at Moncreiffe, nor indeed in Perthshire. I tried to introduce *Zygœna Filipendulæ*, by turning out some of the imagos reared from the pupæ sent by my son, T. G. H., from Winchester, but although they frequented the spot for the rest of the season, I lost sight of them eventually, and they have disappeared. I think they were probably snapped up by the Flycatchers, which were very numerous that season.

Smerinthus Populi.—Common on the lower part of Moncreiffe Hill. I have noticed the larva on young aspens up to about 200 feet. One imago, which I found resting on the grass at the foot of a white poplar, and which had evidently just emerged, was of a peculiarly rich dark tint. Those reared have been of a paler hue and of the common type. I never saw one on the wing that I am aware of. The larvæ feed indiscriminately on the different kinds of poplar, and on sallow and common willow.

Acherontia Atropos.—An imago of this insect was taken in my garden on a privet hedge bordering on a plot of potatoes, and is now in my collection, and one was seen by Mr Herd in 1875, hovering for a moment over sweet-william. In sweeping at it with his net he knocked it down with the stick but did not effect its capture. When struck, he states that it squeaked audibly.

Sphinx Convolvuli.—I have one specimen which I took

* To indicate the abundance, or otherwise, of each species in the district, I append to each name *c* (common), *f* (frequent), *r* (rare), or *v r* (very rare).

hovering over verbena blossom in my garden, on the evening of the 2nd of September 1875. This is the only record I know of this fine insect from Moncreiffe, although I have another specimen taken in the immediate neighbourhood.

Deilephila Galii.—The only specimen which I know to have been taken within the bounds comprised in this paper, was captured by myself, on the evening of the 25th of June 1876, flying at Rhododendron blossom, at the foot of Moncreiffe Hill. I did not note the exact time, but it had become so dark that I had lighted my lantern. My attention was suddenly attracted by a sound which I at first attributed to the humming sound which a steam engine sometimes makes, and which I thought proceeded from one on a neighbouring railway. I became aware, however, that it was not so far distant, and on turning round my lantern, I beheld a splendid specimen of *D. Galii* busily employed at the blossoms of a Rhododendron bush, a few yards from me. It took no notice of the light, and I made a careful and deliberate sweep at it with my net, which I turned over and placed on the ground. The sound suddenly ceased, and on first examining my net, nothing was to be seen. My heart beat almost as loudly as my quarry had hummed. I took hold of the tail of the net and turned it over, when, to my delight, I discovered *D. Galii* close up to the top of the hoop under the stick, evidently having scuttled up as far as he could in his endeavour to escape. Fortunately I had a pocket cyanide bottle with me, plaster of Paris being run in on the top of the cyanide, so that there were no loose fragments to rattle about inside. I mention this as a hint to entomologists who prefer the cyanide loose, as had I used it in that form this splendid specimen would no doubt have been spoiled. As it was, however, I inserted my arm, bottle in hand, under the net, taking care to lift the bag of the net gently towards the lantern which I had placed on the ground, got the mouth of the bottle in front of my captive, into which he wriggled in his attempt to obtain his liberty. As the bottle was long enough to hold him, but not wide enough to allow him to use his wings, he was fairly wedged, and in a very short time ceased to struggle. I took him home, and with a little careful manipulation extracted him from his prison, placed him in a larger Cyanide bottle, and now he graces my cabinet, as perfect a specimen as I could wish to see. I am sorry to say I did not think of this plan when I captured the *S. Convolvuli* above-mentioned, but carried

him home in my net, his struggles causing considerable damage.

Cherocampa Porcellus.—Locally common on Moncreiffe Hill and its base. Firstly, in my garden, at about 100 feet of elevation; Secondly, on the lower face of the hill, on an open space of some hundred square yards, at from 100 to 200 feet of elevation; Thirdly, on another open space towards the summit, at an altitude of about 500 feet or thereabouts. In the first place—*i.e.*, the garden—it is to be met with in the evenings in June and July, flying at Rhododendron, Valerian, Turncap Lily, &c. In the second locality, I take it in June and July, in the evening, at the blossom of the White Campion; and also in May or early in June, according to the season, by searching the plants of *Galium verum*, from mid-day till towards dusk, when splendid specimens may be found, drying their wings after emerging from the pupa, as bright and perfect—perhaps more so—as those artificially reared. All the specimens I have kept for my cabinet I have obtained in this manner. Those noticed in the third locality were also resting on bedstraw; one I secured here on the small white kind *(G. saxatile)*. I have one very beautiful specimen which I captured one evening as it was rising from a bush of bedstraw, probably in its maiden flight, as it is beautifully fresh. It varies from the type in the yellow ground colour being more of a canary colour, in the total absence of red, which colour is supplanted by whitish grey. The posterior wings have the same dark shade along the base as the type, thus relieving the otherwise pale colour of the whole insect. The head, thorax, and abdomen correspond in colour with the wings, although the wool on the thorax is paler. My earliest record for *C. porcellus* is, I think, May 16, 1875; but that, I should say, was unusually early for this district. As a rule it first appears from the 12th to the 20th of June.

Macroglossa Stellatarum is not a common species here, although I can remember it more plentiful than it has been since I commenced collecting. I never heard of more than one or two specimens being seen at Moncreiffe when it ought to have been most plentiful, viz., in the autumn. I usually see a hybernated specimen or two on the face of the rocks, at an elevation of a little over 600 feet, on sunny days in spring, at which time it takes comparatively short flights, settling to sun itself on the flat surfaces of stone occasionally, but when approached

darting off and whizzing about backwards and forwards along the face of the rock, and soon lost to view.

M. bombyliformis.—Both Mr. Herd and I have seen this insect on different occasions, in some of the sunny glades towards the summit, at an elevation of about 600 feet; but I am not aware that it has ever been captured or the larva observed at Moncreiffe.

Trochilium bembeciforme.—The burrows of this species are to be found in every sallow above a certain age. I endeavoured to procure specimens by surrounding the stems with gauze, but was not very successful. Whether the gauze was rotten I do not know, but though it seemed to be strong enough, they managed to bore through, or slip under the edges, and we never took many. On one occasion Mr. Herd and my gardener went the rounds on a very wet morning, and obtained two, one of which had got past the gauze, and was crawling up a branch, and the other was on my gardener's back when first discovered. They always emerged before ten o'clock in the morning. My specimens were obtained about July 11th.

Bembeciforme is the only representation of the *Sesiidæ* which I have heard of being taken at Moncreiffe; and although I have noticed burrows in the poplars which I believe to appertain to *T. apiforme*, I have never proved their identity, and it is possible that *T. bembeciforme* may occasionally burrow in poplar.

(To be continued.)

Occurrence of a supposed undescribed Lepisma.—Mr. Jas. Simpson has sent me specimens of a species of *Lepisma*, which he has found in large numbers in a bakery in Edinburgh. It is much larger than the common "Sugar-fish" *(Lepisma saccharina)*. Mr. Simpson tells me that he was informed that it is only within the last year that it has been noticed in this place, and that from its active habits it is difficult to secure uninjured specimens. There can be no doubt but that it is an imported species, and as it may be undescribed, I give a description:—

Lepisma ———? Candida, supra brunneo, fusco et nigro variegata; oculis nigris, antennis appendicibusque pallide rubro-fuscis; pedibus albis. Antennis corpore plus quam duplo longioribus; appendice anali centrali corpore ⅓ longiore; appendicibus analibus laterabilus corpore æquilongis. Corpore (præcipue lateribus) setis erectis pallide rufescente-fuscis vestito. Long. corp. 6½—8 mm.—F. BUCHANAN WHITE.

Note on the Kestrel.—In the autumn of 1874, on return after a temporary absence, a Kestrel was found in possession of a porch near an open

box that had been put up under the eaves of the house for the nidification of swifts and starlings. It was constantly seen throughout the winter perching on trees and hunting in the grounds; indeed, a pair may have been present, but they were first seen together only in early spring, and when it was noticed that they evidently intended making a nest in the box. Throughout the spring the male was frequently observed carrying food to his mate, and thereafter both probably supplied the young. In the former case the male uttered his peculiar cry a long way off, and the female responded, but he would not approach the house if any one was near. By-and-bye he, and afterwards probably both, took advantage of every meal-hour to supply the wants of the nest, as was readily known by the peculiar cries before entering, or by watching. The ground near the nest was covered with pellets, and these, it need scarcely be said, consisted of the debris (hair and bones) of mice,—shewing how valuable the services of these birds are. Next the open box tenanted by the kestrels was a covered one with two perforations for the starlings, and at least two families of the latter were reared in perfect safety at the same time. Visitors used to think the starlings took special precautions—by thrusting out the head and beak several times to scrutinize—before committing themselves to flight, but the birds had certainly no cause for alarm. The kestrels disappeared for a time in summer (and I think the swifts took possession of the box), but one at least returned before the winter, and remained till spring, and it was hoped that a nest would again have been made in the box. A pair of pigeons, however, separated from the large flock at the Asylum, and seized the open box, and still continue to hold it, to the annoyance of the kestrel and those interested in it.—W. C. M'Intosh, Murthly.

Prevention of the Extermination of Rare Birds.—Permit me in the interest of our rarer Scottish birds, earnestly to pray that such notices as Mr. Herdman's on the Kites at Blair Athole *be not given* place to. The few haunts of these rare birds and others are already well known to scientific ornithologists, whose interest in the cause of their preservation has always, but more especially of late years, prevented them from making them public. I am myself to blame, and can therefore speak feelingly. Careful as I have been to conceal the breeding haunts of the Dotterell in Scotland, one of them has been discovered, and the birds shot. To establish a new fact as to residence of a species in this country, by taking the eggs, and even in solitary instances shooting the bird—*if it cannot be identified otherwise*—is I think justifiable; but once the fact is established, the localities should be carefully concealed, if the true advancement of the happiness of our indigenous birds is desired. The presence of the Kite in Scotland is well enough known to ornithologists, and the localities also to a few who will not persecute them; but why make known to the public, scrupulous and unscrupulous alike, the very spot where it might be the last pair breeds. I know of three nests in Scotland only, bnt I would be very sorry to publish their whereabouts. I hope you will not take amiss my letter on the subject, as I think, and I am sure you will do so also upon consideration, that it is always a good rule carefully to conceal localities for rare birds, &c. Notes on occurrences of rare birds *non*-resident in the country are quite different; but rare indigenous birds, will only become rarer still—and science will be in no way advanced—*however carefully preserved*, if

their sanctuaries are rudely opened to the unscrupulous and often unthinking public.—J. A. HARVIE BROWN, Dunipace, Larbert, Jan. 4, 1877.

Has Melitæa didyma occurred in Scotland?—At p. 25 of vol. x. of the Entomologist (February 1877), Mr J. Jenner Weir notices the supposed occurrence of *Melitæa didyma* in Dumfriesshire. In January last Mr Lennon (who is well known as an acute and successful collector of Coleoptera) sent me an account of his capture of this butterfly. From his letter it appears that he took, in June 1866, a butterfly, which, at the time, he thought was a variety of *Argynnis Selene* or *Euphrosyne*. It was put away in a store-box, into which Mr Lennon happened to look a few months ago, and found the specimen of *didyma* in question. That this specimen is the same that was taken in June 1866 does not necessarily follow, and, though we do not for a moment doubt Mr Lennon's good faith, we cannot help thinking that some mistake has occurred. *M. didyma* is a common European butterfly, and it is not difficult to imagine how a specimen may have been given to Mr Lennon, and he, in his enthusiasm for Coleoptera, forgotten all about it. Mr Jenner Weir, while pointing out all the facts of the case, still thinks that *didyma* is a likely butterfly to occur in Scotland, in which I cannot agree with him. Like other *Melitæa*, *didyma* is abundant where it does occur, so unless the locality has been much altered, it may be expected to turn up this year if it is a native of Dumfriesshire.—F. BUCHANAN WHITE.

THE FAUNA AND FLORA OF CLYDESDALE.*

THE "British Association for the advancement of Science," however it may have failed to fulfil *all* the expectations of its founders, has at least the merit of having by its visits to various localities, forced into crystallization the local streams and rivulets of knowledge: in other words, the British Association has in more than one instance so affected the local naturalists of the place honoured by its visits, that they have been incited to publish in the form of a "guide book," more or less exhaustive lists of the Local Fauna and Flora.

It is perhaps not to be expected that these guide books, published at a price so moderate as not to deter any temporary visitors to the locality from purchasing a copy, should contain more than a curt indication of the distribution of the species in the district, yet, at the same time, they form more or less valuable additions to our knowledge of the geographical distribution of species in the British Islands, and have,

* "On the Fauna and Flora of the West of Scotland." Glasgow: Blackie & Son. 1876. (pp. 148).

furthermore, the merit of laying. in cases where no previous lists of the local productions existed, a foundation on which more elaborate catalogues of the Fauna and Flora may be based, and of acting as an incentive to local collectors to more thoroughly examine their district.

For the meeting of the Association at Glasgow, in 1876, a very excellent local guide book was produced, chiefly under the auspices of the "Glasgow Society of Field Naturalists." The work consists of two portions—an introductory one entitled "Notes on the Fauna and Flora of the west of Scotland," which, amounting to 26 pages, contains a general resumé of several of the groups; and a second part, which occupies most of the volume, consists of lists of the species, with brief indication of their distribution in the district, and is termed "A contribution towards a complete list of the Fauna and Flora of Clydesdale and of the West of Scotland."

The introduction to the mammalia is written by Mr. E. B. Alston, and the list by Mr. T. King. Mr. Alston takes in the whole of the south-western half of Scotland, but the list is confined to Clydesdale. (And here we must notice, what we cannot help considering is to a certain degree a blemish in an otherwise valuable work, and that is the great discrepancy in the size and boundaries of the district adopted by the various authors. In some cases "Glasgow and its vicinity" is the limit; in others, "Clydesdale," whilst some lists purporting to be of the "West of Scotland," include localities so decidedly in the eastern drainage district as Aberfeldy, Rannoch, and Strathglass. To our idea the value of the lists for comparison would have been very greatly increased if they had been strictly confined to Clydesdale, *i.e.*, the district drained by the Clyde and its tributaries.) The Mammalia (including two Cetacea) amount to 32 species, the most noteworthy of which is *Bos Scoticus*—the Wild Cattle of Cadzow Forest. It is remarked that the squirrel, mountain hare, and rabbit have much increased in numbers and range within the last 50 years.

The birds are treated of by Mr. R. Gray (introduction) and Mr. H. C. Young (the list); the first mentioned well-known ornithologist treating of the birds of Glasgow and its vicinity, while the list is confined to those which breed in the nearer vicinity, some 83 in number.

A list of the Reptilia and Amphibia is given by Mr. J.

M. Campbell, and includes the usual 7 widely distributed species and the more local *Lissotriton palmipes*.

The Fishes are not treated of.

An introduction to the Entomology of Clydesdale is given by Mr. P. Cameron, who mentions some of the rarer Coleoptera, Lepidoptera, and Hymenoptera, and alludes to some of the other orders. The lists of insects are rather extensive and valuable. Mr. P. Cameron gives lists of the Hymenopterous families, Tenthredinidæ and Cynipidæ, of the west of Scotland —the "west" in a very "wide" sense, as for some of the species the only locality mentioned is Rannoch, and Dunkeld and Kingussie appear as localities for others. Probably no district in Britain has had these families so well catalogued before.

The Trichoptera of the Glasgow district are treated of by Mr. Binnie, whose list embraces about 60 species. Glasgow is fortunate in possessing such energetic workers at "neglected orders" as Messrs. Cameron and Binnie.

Mr. J. J. King furnishes an extensive list of the Lepidoptera of the Glasgow district, which we are glad to notice includes both the Tortrices and Tineina. Glasgow has been lucky in having had for a long time several veteran Lepidopterologists, such as Mr. T. Chapman, Dr. Colquhoun, &c., and Mr. King has been fortunate in obtaining the benefit of their experience. Most of the species in the list appear to us to have been probably correctly determined, though of the occurrence of a few "macros" and several "micros" in the district under consideration, we must express ourselves rather sceptical, as indeed does Mr. King himself. The latter part of the list will probably receive many additions.

None of the other orders of insects are catalogued, a state of matters which we hope will be amended in the next edition of the work. The lists, as far as they go, are very creditable, but we expected to have seen a list of the Coleoptera at least, remembering that such well-known Coleopterologists as Mr. R. Hislop, and Mr Morris Young, have been, or are, inhabitants of the district.

Mr David Robertson furnishes a list of the Crustacea of the Firth of Clyde, and the same well-qualified naturalist treats also of the recent Marine Mollusca of the west of Scotland. It is to be noted that the list of these Mollusca in the bound volume is faulty, and that Mr. Robertson's name should not have been attached thereto. A new and correct list by Mr Robertson has

been printed, and will be supplied to all who have the volume. Though the list of the Marine Mollusca includes most of the species of the west coast of Scotland, in the list of Land and Freshwater species, by Mr. F. G. Binnie, localites are restricted to lower Clydesdale. The latter list contains seventy-two species, of which two are doubtful inhabitants, and six have been more or less certainly introduced. *Helix concinna* Jeffreys, is not mentioned, probable because it has been overlooked. In our experience it is a species of wide distribution, and easily distinguished when living from *H. hispida.*

Lists of the Actinozoa (24 species, all from Cumbrae) and of the Foraminifera of the Firth, by Mr David Robertson, bring the animals to a conclusion.

With the exception of the Algæ, (and of these a list of the larger marine species is given), all the plants are catalogued. Mr. James Ramsay writes the introduction to the Vascular Flora, taking as his district the west of Scotland in the "wide" sense, and chiefly noticing the rarer plants, as well as the absence or rarity in the neighbourhood of Glasgow, of certain plants usually common in cultivated ground. Mr Ramsay points out that certain common weeds (*Scandix*, &c.,) even when they manage to reach the Glasgow district, fail to establish themselves there, and suggests that there is yet a great deal to learn about the laws which regulate the distribution of plants over even so small a country as Britain. The list of flowering plants is compiled by Mr. R. M'Kay, chiefly from Mr. Hennedy's (whose loss we have had recently to deplore), "Clydesdale Flora," and is restricted to the Clydesdale species. Certain species whose claims to nativity are, to say the least, doubtful, might we think have been advantageously relegated to the list of naturalized species which is given at the end; as it is they are included in the principal list, without any remark to indicate their doubtful nativity. The list is extensive, and probably tolerably complete. That it is not quite so, the following plants which we noticed on the rocks above Loch Oss, near Loch Lomond, during a visit of about half an hour's duration show:— *Draba incana, Saxifraga nivalis, Veronica saxatilis;* and what appeared to be *Sparganium natans* in the Loch. We recommend the Field Naturalists to make an excursion to Loch Oss.

To Dr. Stirton we are indebted not only for several lists but for some highly interesting introductory remarks on the cryptogamic botany of the "West of Scotland." Dr. Stirton includes

in the "West of Scotland" what we are by no means disposed to consider as such, viz., Ben Lawers and other parts of the Breadalbane range, Stirling, Ben Wyvis, etc. Phyto-geographically the bounding line between the east and west of the country is the central watershed, and Breadalbane lies to the east of this, and must be considered as part of the east of Scotland. As a guide to the plants of those parts of Scotland easily accessible from Glasgow, it was perhaps desirable to include Breadalbane, but as forming a foundation for a more extensive catalogue of the Clydesdale Fauna and Flora, as we hope and believe the volume now before us will become, we cannot help thinking it a pity that all the lists were not restricted to Clydesdale.

Before proceeding to examine the lists we will make a few quotations from Dr. Stirton's introduction, more particularly on the peculiarities of the distribution of Cryptogamic plants in the West and West-centre of Scotland.

"Owing to the prevailing moisture throughout the year the climate of the West of Scotland is peculiarly favourable to the growth and development of cryptogamic plants, and as heat, and it may be added sunshine, do not play so important a part in this respect as in phanerogams, nay rather tend towards the arrestment of such growth, these favourable conditions are rather enhanced than otherwise.

"The diversity of the surface into mountain and dale, as well as the encroachment of the sea in the shape of long arms, stretching often far inland, together with the numerous lochs and bogs sprinkled pretty thickly throughout, also afford favourable conditions that scarcely find a parallel in any other part of Europe except the coast of Norway, whose cryptogamic flora approaches closely that of the West of Scotland.

"The geological formations of this part of the country do not present peculiarities of sufficient importance to entitle us to arrogate to them a large share in the disposition of such plants, yet the somewhat greater prevalence in the West and Western Islands of the schistose rocks generally, and especially of the micaceo-schistose (properly so called), affords a presumption that the luxuriance and diversity of the species are owing in part at least to them as a nidus of growth, and this opinion is strengthened when account is taken of the cryptogamic flora of Ben Lawers, to be spoken of hereafter. As the greater part of the given district is Highland, embracing, besides, on its outskirts, Ben Lawers in the east and Ben Nevis in the north, two of the highest mountains in Great Britain, and such that their geological features could scarcely present greater contrasts, it will readily be believed that the cryptogamic botany is diversified to a greater extent than that of any other district of Great Britain. While the low sandy flats of Ayrshire, and especially those in the neighbourhood of Stevenston, almost complete all the known peculiarities of soil to be found in these islands.

"The altitudinal zones are tolerably well marked, but except on Ben

Lawers, and to a less extent on Ben Nevis, there can scarcely be said to be a higher zone than the subalpine. On the former we have, indeed, numerous plants belonging to the two highest zones, viz., alpine and supra-alpine, crowded almost indiscriminately. The causes at work likely to have produced such a congeries of plants on one and the same mountain have often engaged the attention of West of Scotland botanists. Many theories have been propounded, to be as often dismissed. One or two circumstances have, however, rivetted my attention, and as they still cling to me in spite of adverse opinions I think it right to state them fairly and candidly.

"In the first place, no cryptogamic botanist who has repeatedly ascended any of the more prominent of our western mountains can fail to be impressed with the remarkable fact that there are special spots on each mountain, and these generally within very restricted limits, where almost all the rarer alpine plants (the word *alpine* being used in a general sense) may be seen that are likely to be got in each individual case, and that, having once alighted upon such spots, it is almost useless to investigate any others.

"2d. A little experience will further enable the botanist to satisfy himself that such prolific spots are very generally in the form of ravines, or at least hollows, including the sides of such ravines.

"3d. That such hollows have very generally a southern, or more strictly a south-eastern exposure.

"4th. That these slope upwards in a north-western direction, and terminate in a saddle-back, which is almost always of a lower elevation than the rest of the general ridge bounding this hollow on the north. Such hollows are well seen on Ben Lawers, Craig Chailleach, Ben Lomond, Ben Nevis, &c.

"5th. That the parts of the mountain on the other side of this saddle-back, *i.e.*, on its northern aspect, are singularly barren of such alpine rarities.

"Now taking Ben Lawers as our type, it can easily be ascertained by any one even after a cursory survey that the nothern shoulder of the mountain, including that of Craig-na-Gour, is worthless as a field of research; indeed, I cannot recall having ever detected there any moss of any consequence except *Dissodon splachnoides*, and as this was found well up, near the head of the so-called Corrie of Craig-na-Gour, which, in turn, is protected on its north-western aspect by high precipitous rocks, this spot cannot be reckoned as forming an exception to the fact stated above.

"6th. When it is stated, besides, that there are distinct evidences, in the majority of cases, of glacial action high up on the sides of such ravines, but few or none near their base, the conclusion to which the reader's attention is called becomes evident, viz., that such hollows were protected during the period of the glacial drift by solid masses of ice or glaciers, and that such plants (or their spores) as flourished previous to this epoch were not destroyed, but allowed to remain *in statu quo*.

"Still referring to Ben Lawers, all the rare alpine mosses without exception are found in the ravine, or on its lower slopes, which is situated between the mountain and Craig-na-Gour on the west. It is notable also that the truly alpine forms found in this ravine bear a close resemblance to those corresponding to them from the Dovrefeldt Mountains in Norway, so

much so indeed that it is scarcely possible to distinguish at sight whether any particular specimen is Norwegian or Scottish. This fact surprised me more particularly with reference to samples of *Dicranum arcticum*, *Timmia norvegica*, and the alpine states of *Didymodon rubellus* and *Grimmia apocarpa*. I leave the reader's imagination to weave a theory, slender, yet I think tenable, as to the disposition of the surface of the earth in Northern Europe previous to the glacial epoch. My present limits will not permit me to enlarge further in this direction, although much more might be said on certain curious yet close affinities between the vegetation of distant regions of Northern Europe.

Peculiarities of Plant Distribution in the West of Scotland.

"What strikes a stranger most on our western mountains is the unusual prevalence, and, accordingly, luxuriance of species of the genus *Campylopus*. Within a circle of a radius of 5 or 6 miles from Ben Voirlich by Loch Lomond all the Scotch *Campylopi*, with one or two exceptions, may be found, and much the larger proportion of species of the nearly allied genera *Dicranum* and *Dicranodontium*. These mosses give, indeed, a peculiar aspect to the vegetation of these mountains, and they were, besides, the first to give a stimulus to the study of Bryology in the West. In a short period no fewer than six additions in these genera were made to the British Moss Flora. Now reckoning Ben Voirlich as the centre of spread, it is noticeable that in a western direction the prevalence and luxuriance are increased, while the number of species is diminished, until on or near the sea-board the eye is attracted and ultimately wearied by extended patches consisting almost entirely of *C. longipilus*. In the western Islands *C. densus* is the prevailing species, where it is found in extended masses fruiting freely, while in the Outer Hebrides is found the largest and most luxurious species of all, *C. Shawii*. In an easterly direction, on the other hand, the *Campylopi* degenerate and thin off, while the number of species is varied by the occasional intrusion of *C. brevipilus*, as near Tyndrum, a moss which, according to my experience, may be said to have its centre of spread in Ross-shire in the neighbourhood of Auchnault and Loch Maree. On Ben Lawers, still further east, there is scarcely a *Campylopus* to be seen, with the exception of *C. torfaceus* sparingly on the sides of drains near the base, while *C. compactus* is confined to one or two spots in the western ravine already alluded to. Near the east coast these mosses again appear in somewhat greater profusion, but not nearly to the same extent as on the west.

"2d. *Sphagna*, although common everywhere in uncultivated, and more especially boggy or marshy ground, whether Highland or Lowland, are to be met with in greater profusion in our western glens and on the sides of the mountains than anywhere else, and not only so, but the diversity of species and even of forms is more manifest, so far as my experience goes.

"3d. Near Bowling on the Clyde is a prominent rock called Drumbuck, partly basaltic, partly amorphous, and bordered at no great distance by the Old Red Sandstone, on which is found a crowd of mosses of the genus *Grimmia*. No fewer than eleven species have been detected within an area of a dozen yards, and amongst these, are the rare and beautiful

Gr. leucophæa, *Gr. subsquarrosa*, *Gr. Hartmanni*, &c. Now it is remarkable that on the chain of detached rocks of similiar geological formation that stretch at intervals across Scotland from Dumbarton Rock to Arthur's Seat through Stirling Castle Rock, are found members of the same group of mosses, and nowhere else.* This group includes also the the rare *Tortula Mulleri*. On the same rock have been detected minute patches of *Glyphomitrium Davisii* (Schwaeg.) in a barren state. The indefatigable researches of Mr. W. Galt and Mr. G. Thomson have shown that the area of growth of this curious and interesting moss is much more extended than was previously thought. It has been found on almost all the basaltic trap-rocks that crop up at Dumbuck, hills behind Bowling, Kilpatrick, round near Milngavie, thence backward towards Killearn as the Whangie. This constitutes what may be termed a somewhat elevated table-land having a diameter of about 8 miles. More recently this moss has been detected on rocks of a corresponding formation in the islands of Mull and Skye.

"4th. Here and there throughout this district of Scotland are to be found as elsewhere certain isolated plants that do not betray close affinities to any others, and for whose intrusion it is difficult to give any feasible explanation. The thought is apt to strike one that they are the remains of a former flora that has nearly passed away, having served its turn in the grand order of things. As these anomalies in the case of this district are unusually interesting I propose to enumerate several; and first amongst these is *Orthodontium gracile*.

"As every bryologist is aware, this moss, at the time of the publication of Wilson's work on British mosses, had been found in three spots in England and in one in Abyssinia, and nowhere else; a fourth was found in 1862 on sandstone in Lennoxtown Woods, where it fruits freely in March and April. The area of growth is very restricted, not embracing more than 3 or 4 square yards; but it keeps its hold notwithstanding adverse circumstances, for rocks of this formation are perhaps the least favourable to the growth and development of mosses and lichens of almost every kind.

"*Didymodon recurvifolius* (Tayl.), on grassy slopes midway up Ben Voirlich from Loch Lomond, is due to the late Mr. A. M'Kinlay. This is now believed to be the only station in existence for this moss, as that on Knockavohila, in Irleand, is extinct. Apart from the statement of Mr M'Kinlay himself to the effect that he had no fear of the plant becoming extinct on Ben Voirlich, I feel inclined to maintain that this habitat has shared the fate of the Irish one, for on every occasion of a visit to the mountain, I have devoted a share of my time to the rediscovery of the moss, but hitherto without success. This is to be deplored, inasmuch as the death

* On the trap rocks of the neighbourhood of Perth some of the members of the same group occur (*Grimmia leucophæa*, *G. orbicularis*, *G. subsquarrosa*, &c.) Stenton Rock, near Dunkeld, which is trappean, is also very rich in *Grimmiæ*, a good many species being found within a few yards.—EDITOR *Sc. Nat.*

of the discoverer precludes the possibility of any more definite information being arrived as to the exact place of growth.

"*Myurium Hebridarum* (Sch.), detected for the first time in North Uist, by the late Dr. C. Smith of Inverary, has again been found in great luxuriance in the original station. A second station has been revealed by the Rev. Dr. H. Macmillan on the shores of Loch Coruisk in Skye. The only other stations for it are in the Canary Islands and Azores, from the latter of which I have it in fruit gathered by Mr. Moseley of the Challenger Expedition.

"A slender clue is given in this instance, as well as in another already stated, as to the former disposition of the land along the great Mid Atlantic ridge; but I forbear to follow it up, although although there are other botanical examples which go to strengthen the theory of a continuous land-surface along this ridge or bank.

"5th. Other instances of restricted areas of growth might be mentioned; but as such are common to other districts I refrain from multiplying examples. *Three* others may, however, be adduced as indicating what may be termed initiatory stages of specific development, in marked contrast to those previously given, viz., *Orthotrichum Shawii* on an old ash-tree near Dailly, and *Campylopus Shawii* from North Uist, both due to Dr. J. Shaw, now of Cape Town, South Africa. There is little doubt that these are offshoots from *O. cupulatum* on the one hand and *C. alpinus* on the other, and, accordingly, tend towards the Darwinian theory of development, more especially as their botanical characters are quite appreciable, &c. A third is *Didymodon Daldinianus*, clearly an offshoot from *D. cylindricus*, which, besides, is found sparingly throughout our Highland glens, and in fruit in two of these, viz., Campsie, the original station of Dr. Taylor, and in Glen Roy, where it is comparatively abundant. *D. Daldinianus* is a luxuriant moss, and on the hills behind Dunoon and Kilmun has been gathered in huge tufts with stems 3 or 4 inches in length, in this respect at least quite a contrast to the other. Fruiting specimens of this moss have been found on Ben Ledi and near Crianlarich."

The lists of Mosses and Lichens are by Dr. Stirton, who also (in conjunction with Mr. R. H. Paterson), catalogues the Hepaticæ, and the author's name is sufficient guarantee that the lists are extensive and accurate. The mosses include upwards of 520 species (about 453) and varieties (67), of which about 390 are from Clydesdale and the rest chiefly from Perthshire (Ben Lawers, &c.) In like manner the lists of Hepaticæ and Lichens are large; in the latter group, every species that have come under the personal observation of the compiler being included.

Mr. R. H. Paterson is responsible for the very extensive list of Fungi, which "have been gathered in a very few localities," all in Clydesdale. The total number of species mentioned is about 1670, the genus *Agaricus* being represented by 267.

The larger and more perishable fungi are in so many cases difficult to determine correctly, that we think that it is a pity that Mr. Paterson does not mention his authority for the names. Some *Agarici* seem to be almost always constant to their described characters, but others are so variable in their forms and approach other species so closely (being probaby, as Mr. Worthington Smith has suggested, hybrids) that without corroboration by an "authority" we are disposed to hesitate before accepting them. The list under consideration would therefore be more valuable if Mr. Paterson would add to it the "authority" for the determination of the more critical species. Of the less perishable species, we conclude that specimens have been preserved.

Regarding some of the species in this list, we should have been glad to have had more information. For example, *Polysaccum olivaccum* Fr., a species of which it is remarked in the "Handbook of British Fungi," "it is so extremely rare that neither the Rev. M. J. Berkeley nor ourselves have seen a single specimen," is mentioned by Mr. Paterson as occuring at Bothwell. *Æcidium soldanellæ* which has only in this country been recorded from Glasgow Botanic Gardens, is dismissed by the compiler with the simple remark "common," which also is all the information given about the distribution of 28 out of the 29 species of *Æcidium* mentioned, including *Æ. ari* and *crassum*. Regarding the latter two we notice that though *Æcidium ari* is said to be "common," *Arum maculatum* is said, in the list of Phanerogams to be "rare," and that while *Æ. crassum* is said to occur commonly (*Æ. peridymeni* is given as a distinct species) no species of *Rhamnus* is given as occurring at all. We might, if space permitted, give other examples in illustration of our remark that additional information would much increase the value of this list. We expect that the *Vibrissea truncorum* found on Ben Lomond is more likely to be *V. Margarita*, which seems to be rather widely distributed on the mountains.

The volume concludes with a list of the larger marine Algæ of the Firth of Clyde by Mr. J. A. Mahoney.

We have noticed this work at much greater length than we intended, but not more perhaps than it deserves. Though necessarily little more than a catalogue of names, it still forms a valuable contribution towards our knowledge of the distribution of animals and plants in Scotland, and causes us to hope that at

no distant date the Society will be able to publish a larger and more complete Fauna and Flora of Clydesdale.

Proceedings of Nat. Hist. Soc. of Glasgow, Vol. III., Pt. I. (1876).—This part embraces the period between Sep. 1875, and April 1876, and contains fifteen papers, all of which, with two exceptions, relate to Scottish Zoology or Botany, and in the majority of cases to Clydesdale,—a fact which we are glad to be able to note. Besides the longer articles, there are many shorter notes, frequently of much interest, and often relating to specimens exhibited at the meetings. The Society seems to be doing good work, and we wish it all success.

Transactions of Glasgow Soc. of Field Naturalists, Pt. IV. (1876).—This embraces about the same period of time as the above-mentioned. The chief contents include: Descriptions of new British and Foreign Lichens, by Dr. Stirton; on the Prevention of self-fertilization in Plants, by Mr. R. H. Paterson; on the Microscope and Microscopic Illustrations, by Mr. A. Schulze; on the Migration of Birds, by Mr. Allan, whose paper contains a number of tables, showing the arrivals of various birds in various years and in various localities, of which Glasgow does *not* appear to form one; on Dipterous Gall-makers and their Galls, by Mr. F. G. Binnie. There are, besides, a number of notes of varying interest. On the whole we think that, with the exception of what is devoted to the first (in part) and last of these papers, the pages of this Part of the Society's Transactions might have been better employed in records and observations on the *local* natural history. Possibly the Society has spent its present energies in that direction in the Clydesdale lists noticed on another page.

LISTS OF THE COLEOPTERA AND LEPIDOPTERA OF SCOTLAND.—I shall be glad to receive notices of any additions, either in species or in localities, to the parts of these lists already published, as it is intended to take an early opportunity of publishing such addenda.—F. BUCHANAN WHITE.

PHYTOLOGY.

BRYOLOGICAL NOTES.

By Rev. J. FERGUSSON.

Though one cannot be too thankful to have such a work as the Second Edition of "Schimper's Synopsis," published last year, one cannot help being a good deal surprised and disappointed at many omissions which it makes. With regard to Scottish Bryology, Schimper appears to have learned very little since Mackinlay died and Dr. Stirton abandoned the study of mosses for that of lichens. What is still more strange, he seems to have forgotten or ignored some of his own recent species.

For instance, in a paper published in vol. xi. of the "Trans. of the Bot. Soc. of Edin.," Dr. Stirton notices *Zygodon Stirtoni* Schpr., and briefly, but clearly, points out the characters which distinguish it from *Z. viridissimus*. Specimens of this moss, and named *Z. Stirtoni*, were sent by me to many botanists, particularly to Dr. Braithwaite, who, in the Jour. of Bot. 1873, referred them to *Z. viridissimus*, var. *rupestris* Lindberg, which again he held to be identical with Molendo's var. *saxicola*, 1864. On turning to Milde's Bryologia Silesiaca, one finds Molendo's variety *saxicola*, 1861, held to be identical with *Z. rupestris* of *Schimper*, not Lindberg. Knowing nothing of *Z. rupestris* at that time, and possessing specimens showing remarkable variability in the length of the nerve, I adopted Dr. Braithwaite's views, and distributed *Z. Stirtoni* sometimes under that name, sometimes as *Z. rupestris*. Mr. Hobkirk, who had asked and received a series of these specimens, connecting, as I thought, *Z. viridissimus* with *Z. Stirtoni*, read a paper on *Z. rupestris* (*Stirtoni* in reality) at the meeting of the Cryptogamic Society

at Perth, and suggested that it might be regarded as an incipient species. Shortly after, Lindberg, unaware of Dr. Stirton's notice above-mentioned, described, in "Grevillea" for Dec. 1875, a new *Zygodon* which he had gathered at Croumagloun, in the Island of Gotland, &c., under the name of *Z. aristatus*. In a letter to me he acknowledges that this is identical with *Z. Stirtoni* so long known to Scottish botanists, but unknown to him until my specimens reached him last year. It is quite different from his *Z. rupestris*. Whether Lindberg will consider Dr. Stirton's description of *Z. Stirtoni*, when it is brought under his notice, to be sufficiently full and public, I do not know. I think it is, and that therefore the earlier name should be maintained, even although, singularly enough, Schimper takes no notice of either plant in the 2nd edition of the Synopsis. Is it possible that he has done so, because, in his maturer judgment, he rejects both as unworthy of a place, even as varieties?

It is singular how an error once let loose holds its ground. Schimper, Boulay (Flore Cryptogamique de l' Est), Wilson, C. Mueller, Sir W. J. Hooker, and others, all describe *Z. viridissimus* as having no peristome. Old Bridel, who deserves to be oftener consulted than he is at the present day, was more accurate and cautious. His remarks upon the subject in 1826 are quite interesting. "Turnerus non vidit, Hookerus non memorat, nos aut nudum deprehendimus, aut semidestructum cum dentium perditorum vestigiis nonnullis." Hence it appears that the modern error originated in some one refusing to admit the testimony of Bridel and Smith to the effect that they had seen the peristome, and in coming to the conclusion that what was not seen *occasionally* was *never* seen, and consequently did not exist. After examining upwards of 50 capules, and finding traces of a peristome in nearly the half of them, and perfect teeth in a good many of them, I must give my testimony altogether in favour of Bridel.

I do not wish to conclude that what I myself have been unable to see has not been and cannot be seen, but I suspect that there is an error of long standing connected with *Dicranella Grevilleana*. With whom the error originated (if error it be) I have not been able exactly to discover, but all the authors who describe this moss declare the inflorescence to be monoicous, and fix upon this as one of its distinctive characters. For the following reasons I *doubt* if this be so. On coming home last year from Glenshee, where I had gathered *D. Grevilleana* in

abundance, I set about examining it carefully, and, first of all, sought for male flowers on the same stem as the female flowers, but could not find them. They were quite abundant however on separate stems. This being the case a suspicion arose as to whether the Glenshee plant were the true *D. Grevilleana*, a suspicion made stronger still by the leaves not being entire as Wilson describes them. I then examined authentic specimens of *D. Grevilleana*, gathered in Glentilt by Miss MacInroy, at Helsingfors by Lindberg, on Mount Splugen by Schimper, and near Schladming (Styria) by Breidler. These varied very much. The leaves in the Glenshee, Helsingfors and M. Splugen specimens were more or less distinctly serrulate by a few coarse shallow teeth at the apex, and two or three lower down. In the Glentilt and Schladming specimens they were entire. The lid in the Helsingfors specimens was not longer than the capsule. In the Glentilt and Mount Splugen specimens it was rather longer, whilst in those from Schladming it was twice as long. In the Helsingfors, Glentilt, and Mount Splugen specimens, the capsules were faintly striate and substrumose; in the Schladming and Glenshee specimens they were distinctly so. But however much they varied from each other, there was one point in which they agreed, there was *not* a *single case of monoicous inflorescence.*

Some considerable time ago Mr. Grant of Lossiemouth sent me what he supposed to be a *Mnium*, gathered by him in one of his excursions among the Grampians. It seems to me to be *Bryum cyclophyllum*, a very rare European species, and new to Great Britain. The specimens were barren, but agree with European ones in the same state.

Quite recently Mr. R. H. Paterson of Glasgow has sent specimens of several mosses collected by him, principally in Argyleshire, during the summer of 1875. Among these are *Pottia crinita* from the sea side near Kilfinan; *Myurella julacea* in fruit, and *Hypnum Halleri* from Ben Tigh. A still more important species consisted of two stems of the long lost *Neckera pennata*, said to have been gathered by Drummond, at Fotheringham, near Forfar, and by Mr. D. Orr, in Colin Glen, near Belfast. Mr. Roy of Aberdeen and myself not long ago searched the former station for it without success, and Mr. Stewart of Belfast has repeatedly huntedfor it in the Irish station with no better result. Its rediscovery by Mr. Paterson in Balimore woods, Argyleshire, is most interesting, as giving us

a British station in which it may be really gathered at the present moment. Another of Mr. Paterson's mosses was one which he had gathered at the Trossachs last year. The specimen sent was a very small one, but remarkably characteristic in appearance, and quite perfect, having three drooping capsules on exceedingly short fruit-stalks not more than 1-4th of an inch in length. I have little or no hesitation in saying that this is a new British species, viz., *Hypnum Lorentzianum* of Molendo. It agrees well with the description of that species. Neither Molendo nor Schimper appear to have seen the male flowers, though the latter ranks the species in the subgenus *Heterophyllum*, along with *H. Haldaneanum*, and *H. nemorosum*, which are both monoicous. In Mr. Paterson's specimen there were abundance of male flowers on the same stems as the female flowers. Schimper considers that this species might be made the type of a new subgenus,—a remark with which those who know this very peculiar *Hypnum* will at once agree. In the few extremely large inflated cells at the base of the leaf, one is instantly reminded of some sections of the South American genus *Sematophyllum*.

Hitherto Great Britain has been without a representative of *Coscinodon*, a genus uniting some of the characters of *Grimmia* and *Ptychomitrium*, and composed of only four species, which are equally divided between Europe and North America, where they are very rare. This deficiency in the Moss-Flora of Great Britain has now been removed by Mr. Paterson's discovery in Argyleshire of a very interesting and entirely new *Coscinodon*. It is abundantly distinct. I propose to name it *Coscinodon Patersoni*, in honour of its acute discoverer.

Coscinodon Patersoni, n. sp.

Monoicous. *Tufts* compact, grey with a yellowish-brown tinge. *Stems* about ½ inch long, dichotomously branched, branches rather unequal. *Leaves* slightly plicate at the base *strongly plicate along the nerve in the upper half*, without the deep sulci on either side so characteristic of *C. pulvinatus*. Lower leaves oblong-lanceolate, concave, muticous, obtuse; upper leaves obtuse, with densely and shortly toothed hairpoints, which are broad, sometimes pale yellow at the base, straight or connivent, and often longer than the leaf; perichætial leaves more tender, larger, more evidently plicate throughout, very concave, subconvolute, with hairpoints very broad at the base

and concave to 1-5th of their length or more; all the leaves *erect* or *adpressed* both in a wet and dry state. Nerve prominent on the back, thin and channelled in the upper part, usually projecting into the hairpoints. *Margin broadly revolute* on one side, plain or nearly so on the other, except in the uppermost and perichætial leaves. *Cells* at the base near the nerve, long, narrow, subrectangular, becoming shorter and quadrate at the margin, gradually becoming shorter and sinuoso-quadrate in the upper half; all of them somewhat close, thin walled, without the wide intercellular spaces of *C. humilis*. *Inflorescence monoicous.* Male flowers abundant, almost always on a separate branch, which is surmounted with shorter hairpoints, large. Antheridia large, stipitate, without paraphyses, 12 to 14 in each flower. *Calyptra* with about 10 plicæ, 10 short lobes at the base, reaching to the base of the capsule, naked? *Lid* conical at the base, with a slightly inclined obtuse rostrum, fully half the length of the capsule. *Annulus*? *Capsule* brown, long-oval, tapering into the apophysis, showing the columella through its thin walls, scarcely striate, wide mouthed when empty, emergent, *the lid reaching to the top of the long hairpoints. Teeth* of the peristome lanceolate, cloven at the apex, with several perforations, and from 8 to 10 distinct bars, very papillose, pale above, and of a beautiful deep brownish orange below; *erect when dry*. Fruit-stalk about 2 or 3 lines long, straw-coloured.

Abundantly distinct from either of the European species; from *C. pulvinatus* in the inflorescence, leaves, and longer capsule, &c., from *C. humilis* in the stouter habit, direction of the leaves, revolute margin, very much in the areolation and the long fruit-stalk, which sends the capsule straight up to the top of the hairpoints, not peeping out at the side, at or below their base. Unfortunately the specimens were gathered at a season when the fruit appears to have been over-ripe, and are besides very scanty. Hence I have been unable exactly to determine the exact appearance of the plant when growing. Only one calyptra and perfect capsule have been dissected by me, and I have been unable to be so precise as could be wished in describing these. I have a fancy that the calyptra may prove to have a few hairs at the apex. It is to be hoped that perfect and more abundant specimens may be had soon. The plant, so far as the fruit is concerned, looks to the naked eye very like *Grimmia Ungeri*.

STRUCTURE OF THE COMMON MUSHROOM.

By WORTHINGTON G. SMITH, F.L.S.*

THE entire substance of the common Mushroom is made up of excessively small bladder-like cells; these cells are so small in size and light of weight, that no less than 1,500,000,000,000 (one and a half billions of cells) go to every ounce of the Mushroom's weight. Mushrooms are generally grown by dealers from spawn or mycelium; this spawn is nothing but living matted cells in a resting condition, needing warmth, moisture, and darkness only for vivification. Mushrooms may, however, be grown from the purple-black dust which falls from their lower surface. This black dust again simply consists of nothing but cells, but in this case the cells are called spores. These latter are of a somewhat different nature from the simple cells of the flesh of the Mushroom, and their outer coat in this species is changed in colour from transparent to purple-black, possibly from contact with the air.

The cells in the stem of the Mushroom are sausage-shaped, and grow vertically; on reaching the cap these cells spread over in an umbrella fashion, and descend into the internal substance of each individual gill. This internal mass of cells within the gill is termed the "trama" by botanists. (A. A. Fig. I.)

To understand how the Mushroom produces its seeds or spores, a slice should be cut off the side of the cap of a Mushroom from the top downwards. Where the sectional part is now exposed, the gills which are cut through will look like so many small fine teeth of a comb. With a sharp lancet a very small thin transparent fragment must now be sliced off from the top downwards, and placed upon a glass for examination under the microscope.

When magnified 250 diameters this fragment will be seen, as in Fig. I., to consist wholly of simple cells. The sausage-shaped cells of the stem which have spread over the cap and descended into each individual gill are seen between the letters A, A. These "trama" cells are of some importance, because certain members of the Mushroom-tribe have no larger cells of this nature. As

* Read at the meeting of the Cryptogamic Society of Scotland, September 1876. We are indebted to the Editor of the *Gardeners' Chronicle* for electrotypes of the figures.

these latter cells gradually grow towards the exposed surface on each side of the gill, B, B, they get considerably smaller in size,

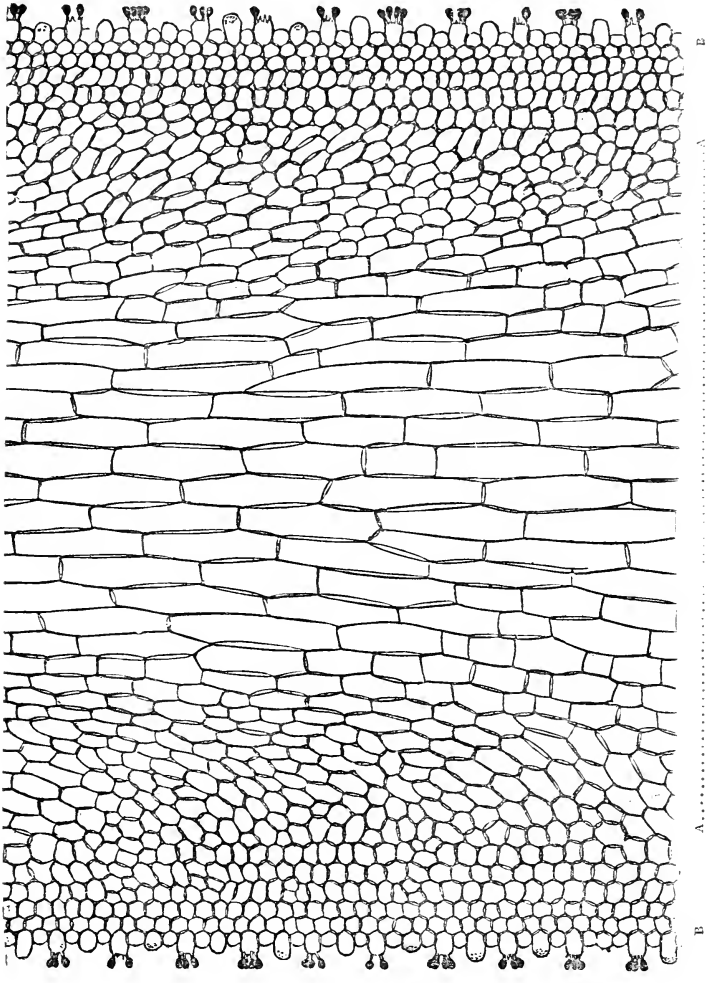


Fig. I.—THE COMMON MUSHROOM (AGARICUS CAMPESTRIS, L.

Vertical transverse section through gill, showing "trama," A, A, and the two hymeni l or spore-bearing surfaces B, B. × 250 diam.

denser, and less and less transparent. The exposed surface of the gill is the fruiting, spore-bearing, or hymenial surface, and

the cells found in this position it is our present purpose to examine somewhat minutely. For this purpose they are further enlarged in Fig. II. to 1500 diameters. The barren surface cells

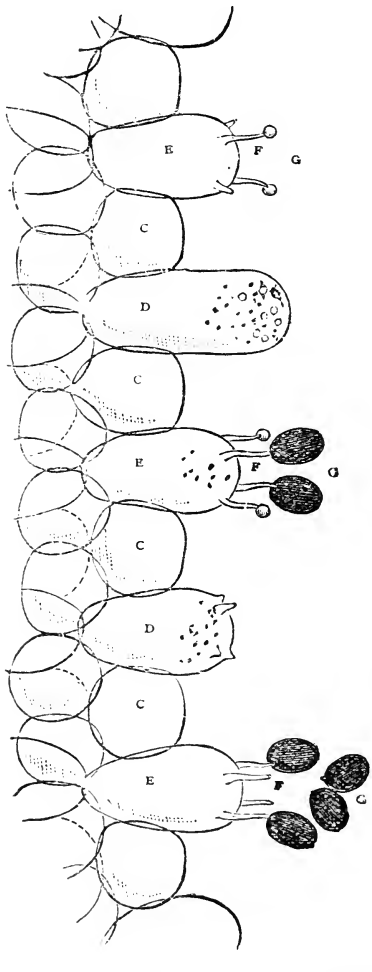


Fig. II.—THE COMMON MUSHROOM (AGARICUS CAMPESTRIS, L.
ction through hymenial or spore-bearing surface; showing simple cells (C); cystidia with granular contents at D, D,—basidia, E, E, E,—and gradual development of spores, G, G, G, upon the spicules, F, F, F: × 1500 diam.

are seen at C, C, C. Intermediate with these are larger cells, D, D, termed cystidia, and believed by many botanists to be

male in their nature, and possessed of fecundative properties, and other cells, E, E, E, named basidia, which carry the spores. The spores are borne on short branches, termed spicules, seen at F, F, F, and the spores in various stages of growth may be seen at G, G, G.

The spores in all the Mushroom tribe are produced in clusters of four on each basidium, but on the common Mushroom and all its varieties, as far as I have seen, these four spores are generally produced two at a time, and, as the first two drop off the last two appear, so that it is seldom that more than two are seen *in situ* at the same time. The two new spores pushing the two old ones off their branches is illustrated on the lower part of Fig. II.

This phenomenon teaches a valuable lesson, and one which has, as I conceive, been quite erroneously interpreted by Professor Sachs (*Handbook*, p. 251), who says the common Mushroom only produces two spores on each basidium, and so illustrates the subject in his fig. 174.

The diagram Fg. III. (enlarged 1500 diameters), illustrates

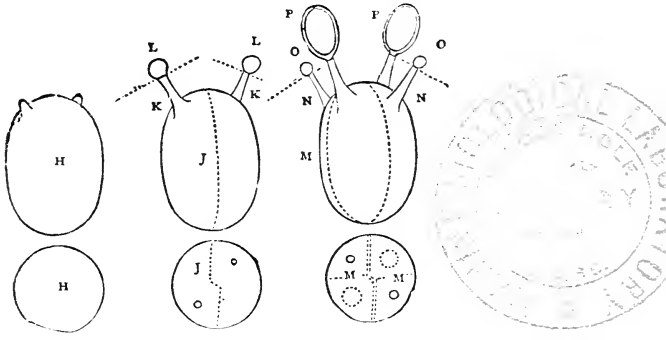


Fig. III.—DEVELOPMENT OF SPORES IN THE MUSHROOM : × 1500 DIAM

what I believe to be the true explanation of the development of the spores in the common Mushroom, and potentially in all the Mushroom tribe. The diagram illustrates the development of a single basidium with its spores ; the upper figures of the latter cut show the basidium as seen from the side, the lower figures the basidium as seen from the top.

The cells of the Mushroom increase in number by transverse partitions which divide each cell into two. The last-formed cell repeats the process continuously till the fungus is complete,

and the special cells (spores) destined for the reproduction of the species are reached. The basidium is first a simple cell, seen in two positions, as at H, H. This simple cell becomes potentially (but often indefinitely) divided by a *longitudinal* partition, as at J, J; each of these divided portions produces a branch, as at K, K, and each of these branches bears a spore (L, L), which in its turn is again cut off by cell division, this time *transversely*. The basidium is now again *longitudinally* divided at M, M; these portions in their turn also produce new branches, which give rise to two more spores (O, O), each spore again cut off by a *transverse* septum. As the two last formed spores increase in size they gradually push the two old ones P, P, off their supports, so that unless the whole process is very carefully watched it might be concluded that the Mushroom produces only two spores (instead of four) on each basidium, as stated by Professor Sachs.

The mature spores on germination of course reproduce the species by means of a series of new cells. All experiments prove the life of the spore to be very short, but when the spore once germinates and forms spawn the latter material has great tenacity of life, and this mycelium is commonly, if not always, perennial.

CONTRIBUTIONS TO THE DESMID FLORA OF PERTHSHIRE.*

No. I.

By JOHN ROY.

So far as I know, the following fragment is the first attempt which has been made to give an enumeration of the Desmids of this large and important county. The list here given, though not large, contains nearly as many species, as are given by Ralfs, in 1848, for the whole of Britain. No doubt it will be greatly increased. The present list is the result of the examination of "gatherings"—from Methven Bog, Arnbathie, Durdie Moor, Rannoch, and near Tyndrum, sent me by Dr. Buchanan White—from Glenshee, by Rev. J. Fergusson—from Birnam Hill, Fowlis Wester, Taymount, and near Scone, by Mr. W. Rutherford,—from Athole and Glenshee collected by myself. The name of the localities will indicate the collectors of each species. For a note of one species, *Cosmarium cymatopleurum*,

* Communicated to the Perthshire Society of Natural Science, January, 1877.

Nordstedt, which is new to Britain, I am indebted to Mr. Wm. Archer, Dublin, the eminent algologist.

Perhaps it may not be thought out of place here to offer a hint or two to intending collectors.

Desmids are pretty generally distributed, being found in streams, as well as pools, but the most prolific localities will generally be found to be permanent shallow pools on heaths. In such situations, a handful of bog-moss taken out of the water and squeezed into a wide-mouthed bottle will be sure to yield something. Another method, which is often very effective, is to plunge a bottle, mouth downwards, into the water; on reaching the mud, turn it over on its side, and move it about, just dipping in the mud, when it will fill rapidly. Stripping the submerged stems of aquatic plants, often yields good results, as does also "squeezings" of mosses or algæ, attached to stones in streams. As a rule lakes give poor results, but little pools, on their margins, are worth trying, if the bottom is muddy. When taken home, the bottles should be placed in the light, with the stoppers removed, and the contents examined as soon as possible. If they have to be kept for some time, the most of the water should be poured off, taking care to preserve the sediment, and the water replaced by a weak solution of Acetate of Potash.

I shall be glad to examine any samples sent to my address, 3 Loanhead Place, Aberdeen, with the view of preparing a supplementary list.

To those gentlemen, who have kindly assisted me, by sending gatherings, I take this opportunity of tendering my hearty thanks.

Hyalotheca Ehr.

1. *H. dissiliens* Sm.—Athole Forest and east from Falar; Methven Bog; Arnbathie, and Durdie Moor; Glenshee; Birnam Hill, and Fowlis Wester.
2. *H. mucosa* Mert.—Methven Bog, and Durdie Moor.

Didymoprium Kutz.

1. *D. Borreri* Ralfs.—Methven Bog, and Rannoch; Glenshee; Fowlis Wester.

Desmidium Ag.

1. *D. Swartzii* Ag.—Methven Bog, Arnbathie, and Durdie Moor; Glen Shee.

Sphærozosma Corda.

1. *S. vertebratum* Breb.—Athole Forest.
2. *S. excavatum* Ralfs—Athole Forest.

Spondylosium Breb.

1. *S. pulchellum* Archer.—Rannoch; Glenshee; Fowlis Wester.

Some months since, Mr. Archer sent me *stipitate* examples of this species from Ireland. They are also stipitate in the Fowlis Wester gathering.

Micrasterias Ag.

1. *M. denticulata* Breb.—East from Falar, and in Glenshee; Methven Bog, and Rannoch; Birnam Hill.
2. *M. Thomasiana* Archer.—Durdie Moor.
3. *M. rotata* Grev.—Methven Bog, and Durdie Moor; Birnam Hill.

4. *M. papillifera* Breb.—Methven Bog, and Durdie Moor.
5. *M. americana* Ehr.—Glenshee.
6. *M. truncata* Corda.—Durdie Moor, and Rannoch; Glenshee; Birnam Hill, and Fowlis Wester.
7. *M. Jenneri* Ralfs.—Birnam Hill.
8. *M. mucronatus* Dixon.—Glenshee.

EUASTRUM Ehr.

1. *E. verrucosum* Ehr.—Athole Forest and Glenshee; Durdie Moor.
2. *E. oblongum* Grev.—Athole Forest, east from Falar, and Glen Shee Methven Bog, Durdie Moor, Arnbathie; Birnam Hill and Fowlis Wester.
3. *E. crassum* Breb.—Athole Forest, and Glenshee; Rannoch.
4. *E. humerosum* Ralfs.—Glenshee.
5. *E. affine* Ralfs.—East from Falar, and Glenshee; Rannoch.
6. *E. ampullaceum* Ralfs.—Athole Forest, and Glenshee; Methven Bog, and Rannoch; Fowlis Wester.
7. *E. insigne* Hass.—Arnbathie and Rannoch; Glenshee.
8. *E. didelta* Turp.—Athole Forest; Methven Bog, Arnbathie and Rannoch; Birnam Hill.
9. *E. ansatum* Ehr.—Athole Forest; Durdie Moor, Arnbathie, Methven Bog, and Rannoch; Birnam Hill.
10. *E. pectinatum* Breb.—Athole Forest, east from Falar, and in Glenshee; Methven Bog, and Durdie Moor; Birnam Hill.
11. *E. gemmatum* Breb.—Birnam Hill.
12. *E. rostratum* Ralfs.—Athole Forest; Rannoch; Glenshee; Birnam Hill and Fowlis Wester.
13. *E. elegans* Breb.—Athole Forest, and Glenshee; Methven Bog, Durdie Moor, and Arnbathie; Birnam Hill, and Fowlis Wester.
14. *E. binale* Turp.—Athole Forest; Methven Bog, Durdie Moor, Arnbathie, and Rannoch; Glenshee; Birnam Hill and Fowlis Wester.

Several distinct species are, at present, associated under this name.

15. *E. insulare* Witt.—Durdie Moor.
16. *E. angustatum* Witt.—Glenshee.
17. *E. cuneatum* Jenner.—Rannoch; Glenshee.

COSMARIUM Corda.

1. *C. quadratum* Ralfs.—Athole Forest.
2. *C. cucumis* Corda.—Arnbathie; Glenshee.
3. *C. Ralfsii* Breb.—Durdie Moor and Rannoch.
4. *C. pyramidatum* Breb.—Athole Forest; Rannoch.
5. *C. pseudo-pyramidatum* Lundell.—Rannoch.
6. *C. tinctum* Ralfs.—Athole Forest and east from Falar; Durdie Moor.
7. *C. bioculatum* Breb.—Athole Forest; Durdie Moor.
8. *C. granatum* Breb.—Athole Forest; Durdie Moor, and Arnbathie; Birnam Hill.
9. *C. Meneghinii* Breb.—Athole Forest; Durdie Moor, and Arnbathie.
10. *C. angulosum* Breb.—Athole Forest; Birnam Hill.
11. *C. venustum* Breb.—Rannoch; Fowlis Wester.
12. *C. pygmæum* Archer.—Athole Forest; Rannoch; Fowlis Wester.
13. *C. pusillum* Breb.—Rannoch.

14. *C. tetragonum*, Näg. (the Swedish form).—Durdie Moor.

15. *C. nymannianum* Grunow.—Athole Forest; Rannoch; near Fowlis Wester.

16. *C. Hammeri* Reinsch, b. *minus*.—Athole Forest.

17. *C. sinuosum* Lundell.—Methven Bog.

18. *C. tetrachondrum* Lundell.—Durdie Moor.

19. *C. depressum* Näg. (not of Bailey).—Durdie Moor. This appears to be only a spineless form of *Arthrodesmus convergens* Ehr.

20. *C. circulare* Reinsch. Athole Forest.

21. *C. crenatum* Ralfs.—Athole Forest and Glenshee; Methven Bog, Arnbathie, and Rannoch. Var. *bicrenatum* Nordstedt.—Durdie Moor.

22. *C. undulatum* Corda.—Athole Forest and Glenshee.

23. *C. cymatopleurum* Nordst.—Roadside between Killin and Kenmore.

24. *C. notabile* Breb.—Athole Forest.

25. *C. sportella* Breb.—Durdie Moor; near Scone.

26. *C. celatum* Ralfs.—Birnam Hill.

27. *C. quadrifarium* Lundell.—Athole Forest.

28. *C. Regnesi* Reinsch.—Durdie Moor.

29. *C. Brebissonii* Menegh. Durdie Moor; Birnam Hill.

30. *C. tetraophthalmum* Breb.—Athole Forest, east from Falar, and Glenshee; Birnam Hill.

31. *C. botrytis* Menegh.—Athole Forest, east from Falar, and Glenshee; Durdie Moor and Arnbathie; large form near Scone.

32. *C. margaritiferum* Menegh.—Methven Bog and Durdie Moor.

33. *C. reniforme* Ag.—Durdie Moor.

34. *C. amœnum* Breb.—*Forma major* Lundell.—Glenshee. A distinct species.

35. *C. Portianum* Archer.—Athole Forest; Durdie Moor.

36. *C. moniliforme* Turp.—Athole Forest; Arnbathie; Glenshee.

37. *C. phaseolus* Breb.—Athole Forest and Glenshee; Durdie Moor; Fowlis Wester. Var. *β elevatum* Nord.—Rannoch.

38. *C. gotlandicum* Wittk.—Glenshee.

39. *C. cucurbita* Breb.—Rannoch; Glenshee; Fowlis Wester.

40. *C. palangula* Breb.—Athole Forest; Rannoch.

41. *C. Thwaitesii* Ralfs.—Athole Forest; Birnam Hill.

42. *C. curtum* Breb.—Near Tyndrum.

43. *C. obliquum* Nordst.—Glenshee.

Xanthidium Ehr.

1. *X. armatum* Breb.—Methven Bog and Rannoch; Glenshee.

2. *X. aculeatum* Ehr.—Durdie Moor.

3. *X. antilopœum* Breb.—Glenshee.

4. *X. cristatum* Breb.—Durdie Moor. *β uncinatum* Breb.—Arnbathie.

Arthrodesmus Ehr.

1. *A. convergens* Ehr.—Durdie Moor.

2. *A. Incus* Breb.—Athole Forest; Rannoch; Glenshee.

3. *A. bifidus* Breb.—Athole Forest.

4. *A. octocornis* Ehr.—Athole Forest. *β major* Ralfs.—Rannoch; Glenshee.

STAURASTRUM Meyen.

1. *S. mucronatum* Ralfs.—Athole Forest; Durdie Moor and Rannoch; Glenshee; Fowlis Wester.

2. *S. dejectum* Breb.—Athole Forest and east from Falar; Durdie Moor, Arnbathie, and Rannoch; Glenshee; Fowlis Wester. Var. γ *connatum* Lundell.—Rannoch.

3. *S. Dickiei* Ralfs.—Athole Forest.

4. *S. cuspidatum* Breb.—Athole Forest.

5. *S. megacanthum* Lundell.—Athole Forest.

6. *S. brachiatum* Ralfs.—Glenshee; Rannoch.

7. *S. margaritaceum* Ehr.—Athole Forest; Durdie Moor and Rannoch; Glenshee.

8. *S. alternans* Breb.—Athole Forest; Methven Bog, Durdie Moor, and Rannoch; Birnam Hill.

9. *S. tricorne* Breb.—Durdie Moor.

10. *S. dilatatum* Ehr.—Durdie Moor and Arnbathie.

11. *S. punctulatum* Breb.—Athole Forest and Glenshee; Durdie Moor; Scone.

12. *S. muricatum* Breb.—Athole Forest, east from Falar, and Glenshee; Methven Bog.

13. *S. asperum* Breb.—Rannoch.

14. *S. hirsutum* Ehr.—Athole Forest; Durdie Moor and Rannoch.

15. *S. teliferum* Ralfs.—Athole Forest; Methven Bog and Durdie Moor.

16. *S.* ——? Species agreeing nearly with one figured by Reinsch in his recent work, "Contributiones ad Algologiam et Fungologiam" Tab. xvii. fig. 5.—Athole Forest,

17. *S. monticulosum* Breb.—Glenshee.

18. *S. Griffithsianum* Näg. Small form.—Rannoch.

19. *S. scabrum* Breb.—Fowlis Wester.

20. S. *furcatum* Ehr.—Athole Forest; Glenshee.

21. *S. polymorphum* Breb.—Athole Forest; Durdie Moor; Glenshee; Fowlis Wester. Several species included under this name.

22. *S. cyrtocerum* Breb.—Durdie Moor.

23. *S. controversum* Breb. Methven Bog.

24. *S. aculeatum* Ehr.—Durdie Moor.

25. *S. vestitum* Ralfs.—Durdie Moor.

26. *S. oxyacanthum* Archer.—Durdie Moor.

27. *S. gracile* Ralfs.—Durdie Moor.

28. *S. paradoxum* Meyen.—Rannoch.

29. *S. tetracerum* Kütz.—Athole Forest and Glenshee; Birnam Hill.

30. *S. tumidum* Breb.—Methven Bog; Birnam Hill.

31. *S. grande* Bulnh.—Athole Forest.

32. *S. orbiculare* Ehr.—Athole Forest and east from Falar; Methven Bog, Durdie Moor, Arnbathie, and Rannoch; Glenshee; Birnam Hill.

33. *S. inconspicuum* Nordst.—Athole Forest; Rannoch.

34. *S. pilcolatum* Breb.—Rannoch.

TETMEMORUS Ralfs.

1. *T. Brebissonii* Menegh.—Methven Bog, Durdie Moor, and Rannoch, where also β *minor* de Bary occurs; Glenshee.

2. *T. levis* Kütz.—Athole Forest.

3. *T. granulatus* Breb.—Athole Forest and east from Falar; Methven Bog, Durdie Moor, Arnbathie, and Rannoch; Birnam Hill.

PENIUM Breb.

1. *P. margaritaceum* Ehr.—Athole Forest, east from Falar, and Glenshee; Durdie Moor.

2. *P. cylindrus* Ehr.—Durdie Moor.

3. *P. lamellosum* Breb.—Methven Bog, Durdie Moor, and Arnbathie; Fowlis Wester.

4. *P. digitus* Ehr.—Athole Forest; Durdie Moor and Rannoch; Glenshee; Birnam Hill and Fowlis Wester.

5. *P. oblongum* de By.—Glenshee.

6. *P. Nägellii* Breb.—Durdie Moor.

7. *P. closterioides* Ralfs.—Birnam Hill.

8. *P. navicula* Breb.—Athole Forest and east from Falar; Rannoch.

9. *P. interruptum* Breb.—Birnam Hill.

10. *P. polymorphum* Perty.—Athole Forest; Glenshee.

11. *P. Mooreanum* Archer.—Athole Forest.

12. *P. rufo-pellitum* mihi n. s.—Almost cylindrical, widening very slightly from the middle to the ends, which are perfectly circular; chlorophyl plates numerous, close, and parallel; membrane very dark brick-colour, minutely and closely scrobiculato-punctate; the colour and puncta are in the outer pellicle, which sometimes comes off, and leaves the inner colourless and smooth; suture distinct.

Length, $\frac{1}{578}$ in.; breadth at suture, $\frac{1}{913}$ in.; do. near the ends, $\frac{1}{860}$.

P. rufescens Cleve, is the nearest ally of this little species, but that species appears to be quite cylindrical, not slightly widening towards the ends, besides this species is of stouter habit, and has more numerous chlorophyl plates. From *P. truncatum* Ralfs, it differs in the round, not truncate, ends, and the brown, not green, colour.

Distrib.—In Scotland—Aberdeen, Kincardine, Perth. In Ireland—Connemara. Perthsh. Loc.—Glenshee.

13. *P. Brebissonii* Menegh.—Athole Forest and east from Falar; Methven Bog; Fowlis Wester.

CYLINDROCYSTIS Menegh.

1. *C. crassa* de Bary.—Fowlis Wester.

DOCIDIUM Breb.

1. *D. clavatum* Kütz.—Athole Forest.

2. *D. Ehrenbergii* Ralfs.—Athole Forest; Methven Bog, Durdie Moor, and Arnbathie.

3. *D. dilatatum* Cleve.—Rannoch.

4. *D. baculum* Breb.—Athole Forest.

5. *D. minutum* Ralfs. *Forma major* Lundell.—Durdie Moor.

GONATOZYGON de Bary.

1. *G. Ralfsii* de By.—Arnbathie.

2. *G. Brebissonii* de By.—Durdie Moor and Arnbathie.

SPIROTÆNIA Breb.

1. *S condensata* Breb.—Athole Forest, east from Falar, and Glenshee; Rannoch.

2. *S. truncata* Archer.—Birnam Hill.

3. *S. minuta* Thuret.—East from Falar.

CLOSTERIUM Nitzsch.

1. *C. didymotocum* Corda.—East from Falar; Durdie Moor; Birnam Hill.

2. *C. striolatum* Ehr.—Methven Bog, Durdie Moor, Arnbathie, and Rannoch; Glenshee; Birnam Hill, Taymount, and Fowlis Wester. More than one species included under this name.

3. *C. intermedium* Ralfs.—Glenshee; Methven Bog and Durdie Moor.

4. *C. costatum* Corda.—Methven Bog, Durdie Moor, and Arnbathie.

5. *C. angustatum* Kütz.—Durdie Moor, Arnbathie, and Rannoch.

6. *C. juncidum* Ralfs.—Athole Forest; Methven Bog and Arnbathie.

7. *C. directum* Archer.—Rannoch.

8. *C. lunula* Müller.—East from Falar and Glenshee; Methven Bog and Arnbathie; Birnam Hill.

9. *C. acerosum* Schrank.—Athole Forest.

10. *C. Pritchardianum* Archer.—Durdie Moor.

11. *C. lineatum* Ehr.—Methven Bog, Durdie Moor, and Arnbathie; Birnam Hill.

12. *C. attenuatum* Ehr.—Athole Forest; Birnam Hill.

13. *C. Malinvernianum* de Not.—Athole Forest and east from Falar.

14. *C. moniliferum* Bory.—East from Falar; Durdie Moor; near Scone.

15. *C. Ehrenbergii* Menegh.—Athole Forest and east from Falar; Durdie Moor; near Scone.

16. *C. Leibleinii* Kütz.—Athole Forest and east from Falar; Methven Bog and Durdie Moor; Birnam Hill and near Scone.

17. *C. Dianæ* Ehr.—Methven Bog, Durdie Moor, Arnbathie, and Rannoch; Birnam Hill.

18. *C. Venus* Kütz.—East from Falar; Rannoch.

19. *C. parvulum* Näg.—Durdie Moor and Arnbathie.

20. *C. Jenneri* Ralfs.—Durdie Moor; Birnam Hill.

21. *C. rostratum* Ehr.—Methven Bog; Taymount.

22. *C. setaceum* Ehr.—Durdie Moor; Birnam Hill and Taymount.

23. *C. decorum* Breb.—Athole Forest.

24. *C. cornu* Ehr.—Athole Forest; Birnam Hill.

25. *C. acutum* Lyngb.—Athole Forest and east from Falar; Methven Bog and Durdie Moor.

26. *C. gracile* Breb.—Durdie Moor and Rannoch; Birnam Hill.

27. *C. linea* Perty.—Rannoch; Glenshee.

28. *C. strigosum* Breb.—Rannoch; Taymount and near Scone.

A BOTANICAL RAMBLE IN GLENSHEE.

In July last year, after having spent some time on the Forfarshire coast and mountains, I passed over the Cairn-o'-Month to Strachan, where Messrs. Sim and Roy were busily and successfully engaged in investigating the botany of the surrounding district. It was my intention, after having spent a few days with them, to have gone down the Cowie in Kincardineshire, but learning that the banks of this stream had been recently explored, and that Dr. Trail was likely to take charge of a part of the Kincardineshire coast which was not well known, I started alone for Glenshee, the cryptogamic botany of which had been totally neglected. As mentioned in this Journal (Oct. 1873, April 1875,) I expected that *Anacalypta latifolia* would yet be found about the Cairnwell. I was anxious to satisfy myself on the point; accordingly, having taken the first train from Banchory to Ballater and the coach from Ballater to Castleton of Braemar, I started from the latter place for Spittal of Glenshee, which was about 15 miles off. The day, which in the morning was cold, stormy, and rainy, broke up, and became as delightful as a solitary botanist amid "the silence of the glens" could desire, and as I had abundance of time I took the road leisurely; and greatly blessed by the exhilarating air, came to the decided conviction that most of the human species were ignorant barbarians who knew no better than to live in the roar and dirt of towns. Will there ever come a time when our country-men will desert the old kitchen-middens of their forefathers, move more inland, and occupy the higher regions of the island?

Shortly before the time of which I write, I had heard some controversy as to the geographical distribution of *Raphanus raphanistrum* over the N. E. of Scotland. It was maintained that it was very rare or entirely awanting in some quarters, and that many localities assigned to it on examination yielded only *Sinapis arvensis*, which it so much resembles. There is, no doubt, a good deal of truth in this; but on Deeside, from Banchory upwards, both plants occur, and can easily be distinguished at a distance. I found both ascending to the highest cultivated land in Glenclunie.

A little beyond the shooting lodge there, and on the left side of the stream, rises a low ridge of hills, the green short pasture of which, and the conformation of their rocks, indicates the presence of limestone; so I resolved to give them a hurried visit, hoping that *Anacalypta* might have honoured them with its presence: but no. Still I was pleased to find about and on them such flowering plants as *Ranunculus bulbosus*, *Pimpinella saxifraga*, *Tofieldia*, *Arenaria serpyllifolia*, &c.; and such cryptogams as *Orthotrichum anomalum*, *Tortula ruralis*, *Hyp. sarmentosum*, *Hyp. scorpioides*, *Hyp.*

chrysophyllum, and *Trichostumum neglectum* Wils. MS. Much more unexpected than any of these was the fungus *Amanita vaginata*, var. *rufa*, growing in a sheltered corner without a single bush within a mile of it, a discovery which astonished me as much as my finding *Russula emetica* growing with *Mulgedium alpinum*, within a few hundred feet of the summit of Lochnagar! A rarer fungus got a little lower down was *Puccinia bistortæ*, a species which had been got shortly before in England.* In Glenclunie it was very scarce, only a few specimens having been seen.

After spending two good hours there, I took the road again, and scarce slackened pace until the top of the Cairnwell was reached. It is the scene of many a thrilling story of Catrins and funerals in the olden time, a weird and lonely place, with the appearance of graves and the smell of ghosts about it. Here too one is within a hundred yards or so of that dreadful place "The Devil's Elbow," and unconsciously finds himself keeping a sharp look out, and hurrying onwards with a creeping, electric sensation about his scalp, and with his hat actually rising an inch or two above its usual place of rest. No botanist has ever had the courage to prosecute his studies there for more than a minute or two at a time. For my part, after "putting myself outside of something" at the well to sustain my courage, and snatching from the way side a leaf of *Alchemilla* covered with *Uromyces* I sped onwards until the cheerful green hills of Glenshee and the whole of Glenbeg came into full view. Half way down the southern slope of the hill, limestone again becomes conspicuous, and once more an ineffectual search was made for *Anacalypta*. Quantities of *Tortula tortuosa* in fruit were found here, however, and lower down I found *Tortula Hornschuchiana*, very far above the limits at which I had supposed it stopped. It is quite a rare Scottish species.

By this time the sun had gone down behind Cor-hee. The light was beginning to fade away from the sky. Suddenly a thick summer-evening mist filled the glen to the top of the Glasmhaol and Ben-Ghuilipin. The black-headed sea-gulls from Loch-nan-ean, and the white-headed ones from Loch Bainie, had lost their way in it, and, fearing that they could not get home before morning, were flying about, east and west, up and down, north and south, in the wildest distraction, and screaming like mad. As I walked down the glen, I felt that, after all, the man who has beneath his feet a good firm road along which many wayfarers have passed before him is vastly better off than those creatures who seek a pathway in the air or in the sea. At last, in the grey gloaming, I reached the Manse of Glenshee, which a friend of mine had taken for summer lodgings for a few weeks, and after being made very comfortable, slept the sleep which is too sweet and sound for dreams.

* We gathered *Puccinia bistortæ* in Braemar three or four years ago.—Ed. *Sc. Nat.*

Next day, the 19th July, the air was full of that "clear shining after rain," cool and exquisitely delicious. After sauntering about the church and churchyard, I started for Glenbeg. On my way upwards I gathered several very rare fungi, among which were *Septoria* and *Dothidea geranii*, *Trichobasis geranii*, *Puccinia calthæ*, *P. Fergussoni*, abundance of *Æcidium parnassiæ*, and *Uredo orchidis*; several *Peziza* and *Ascoboli*. Among the mosses there were *Mnium subglobosum*, *M. insigne*, *Hypnum giganteum*, a moss which has often been confounded with *H. Breidleri*, so that Scottish botanists who think they have gathered this moss had better be sure that there is no mistake about it. Further on *Carex capillaris* was discovered, descending to about 1400 ft, a low altitude on the Grampians, though I have gathered it at the seaside, on the north coast of Sutherland, associated there with *Dryas octopetala* and *Oxytropis uralensis*. Here in Glenbeg, *Orchis incarnata* was found very sparingly. It seems usually to indicate the presence of lime in the soil on which it grows. *Ranunculus bulbosus* and *Geranium* were traced up to about 1700 feet. On Ben Lawers Dr. Stirton pointed out to me the former of these plants at a much higher altitude; whereas on the other hand in Forfarshire it is confined almost exclusively to the coast. The highest limit assigned to it in th "Student's Flora" is 1500 feet.

The flowering plants not being very interesting were abandoned for the mosses. *Tortula tortuosa* again showed abundance of fruit. This indeed is the only place known to me where it can be had in almost any quantity in this condition. By and by came quantities of *Meesia uliginosa*, as well as a few capsules of *Catascopium*, ever welcome because of its rarity and prim, tidy, brunette aspect; and at last on limestone rocks which on the previous evening I had marked out as worthy of special search, *Anacalypta latifolia*. Along with it were *Seligeria pusilla*, *Tortula reflexa*, *Tortula ruralis*, *T. unguiculata*, or some other allied species which has puzzled me immensely. There were also several other interesting species found near the same place, but they are too numerous to be mentioned. The only *Jungermania* of interest which I noticed was *Frullania fragilifolia*. It was pointed out to me by Mr. Sim a few days previously, and I found afterwards that I had gathered it at Aberdour in 1873.

The early part of next day was devoted to pic-nicing—a most pleasant thing in any place, but above all places in Glenshee, when the year is at its best and the day is the finest in a century perhaps. The afternoon was devoted to botanizing. *Draba inflata*—a trifle too much made of now a-days—was found growing on a rock along with a much rarer plant which I had only once gathered before, viz., *Thlaspi alpestre*. Only a few plants of it were got. The fruit on the lower part of the spike was over ripe, but some pods were got, and showed the style to be rather longer than the lobes, sometimes however only as long. Alpine plants seemed to be rare, only *Saxifraga oppositifolia*, *Potentilla salisburgensis*, and a few others of no importance

were observed. The mosses were more important, but those which were so seemed crowded into about an acre of ground. First, *Dicranella varia*, var. *tenuifolia* = *D. fallax* Wilson—far above the limits at which I had previously observed it. Then came in rapid succession *Campylopus Schimperi* and *Mnium spinosum*, both very rare British species, and confined almost exclusively to the Ben Lawers district. Then came a prize—*Dicranella Grevilleana*, and in abundance, too, but unfortunately the capsules were only just beginning to form at the apex of the abundant fruit-stalks. Old capsules were plentiful enough, but were without lids. Finally came *Amblyodon dealbatus*, *Cinclidium*, which I don't quite understand, and other things which I have neither time nor space to mention.

Next morning I started to survey the upper reaches of Glentatnich, and to collect fresh water algæ. Glentatnich looks well at a distance, especially that grand Corrie at its head on the south side, but the rocks look hard, quartzose in fact. In the afternoon I left Glenshee, resolving to visit it again as soon as I could. J. FERGUSSON.

FERN, by Brechin.

Notes on Cryptogams.—On the distribution of Buxbaumia aphylla in the West of Scotland.—This most singular moss may often be found in places where botanists are not in the habit of looking for it.* Although generally found among fir trees, it occurs in places where there are none in the neighbourhood, *e.g.*, in Fin Glen. Owing to its small size it has no doubt often been overlooked, and hence is considered pretty rare. It will be seen, however, from the following, that it is widely distributed in the West of Scotland. It has been found in the following stations, viz.,—Fin Glen, on an open space of ground, ten capsules; Campsie Glen, among fir trees, found by Mr. Lyon; Bowling, among fir trees near the top of Drumbuck, found by Mr. Lyon; Helensburgh, I gathered nearly forty capsules in a fir wood near the skating pond; Rowardennan, Loch Lomond side, occurs here and there in a fir wood at the foot of Ben Lomond; Kilfinan, Loch Fyne, I gathered eighteen capsules in Otter Wood there, while in search for fungi, to which class of plants it bears a strong resemblance.—R. H. PATERSON, Glasgow.

Exotic Fungi from the Botanic Gardens, Glasgow.—Although the past year was on the whole very unfavourable to the Fungologist, during the months of May, July, and August, several species of Fungi made their appearance on the plants in the new range of hot-houses in the Glasgow Botanic Gardens. None of them, however, can be considered as British Fungi, as they belong in the most part to tropical countries. Among those that have already been determined may be mentioned the following:—

* We have twice found it in rather unusual places—once on ledges of rock on a bare hill, and another time on the top of a turf-coped wall.—*Ed. Scot. Nat.*

1. *Polyporus sanguineus*, which occurs on a large specimen of the bread-fruit tree (banana). 2. *Polyporus pergameus*, occurs on plants in the mossery; it is not unlike some of our common species of *Polypori*. 3. *Polyporus cinnabarinus*, a very large fungus which exudes a blood-red juice when cut or bruised; it occurs in the old range of houses, among the large tree ferns. 4. *Stereum lobatum*, a large and beautiful species spreading over the decaying species of *Dicksonia*, in the new range of houses; the lobes of this fungus are very well developed. Besides these there are a number of species that have not been determined, *e.g.*, a species of *Lenzites* of a snow-white colour. It is difficult to account for the appearance of so many decidedly exotic species of Fungi in so short a time. During the year there were added a number of tree ferns, &c., which were imported direct from New Zealand; but whether the fungi or their spores were brought along with the ferns I am not in a position to say. I certainly never before observed any of these forms in the Botanic Gardens, although I am very often about the hot-houses, and had they been there no doubt I would have observed them. It is a great pity that none of those who are connected with the Botanic Gardens know anything about this class of plants, otherwise I have not the least doubt many more species of fungi would be added to our flora.—*Id.*

Rare British Fungi.—During the autumn of last year I found the following new or rare fungi in the west of Scotland:—1. *Sphæria parallela*, found in abundance on decayed wood at Innellan, in the month of July. I am not aware of its having been found in Scotland since Dr. Greville's time. 2. *Tympanis pinastris*, nearly all without fruit. It occurs on the leaves of fir trees in Castle Toward plantation. This is new to Britain. 3. *Trichobasis rumicum*, on the leaves of *Rumex crispus* and *R. obtusifolius* on the sea shore, Loch Striven. 4. *Æcidium orobi* var. *phaseoli*, occurs on rubbish heaps at Innellan. 5. *Uredo potentillarum* var. *alchemillæ*, on the leaves of *Alchemilla vulgaris* in the woods at Innellan, and on *Alchemilla alpina* near the summit of Ben Lomond. All the fungi in these communications have been verified by Dr. M. C. Cooke, London.—*Id.*

A new British Peziza.—A fungus found by Sir T. Moncreiffe on decaying sallow catkins in his garden (where, or in the immediate vicinity of which, several new or rare fungi have occurred), has been identified by Mr W. Phillips—who has made a speciality of the Elvellacei—as *Peziza amentacea* Balb. (*P. julacea* P.) It has been also found on cathins of alder.—F. Buchanan White.

Exidia repanda.—Among a number of fungi sent me for examination a few weeks ago, by Mr John Sim, Strahan, there occurred an *Exidia*, which I took to be *Exidia repanda*, Fr., and on submitting a specimen to the Rev. M. J. Berkeley, he confirmed my opinion. This is the first time the species has been found in Britain. It occurred, Mr. Sim writes me, on holly, near Crathie.—J. Keith, Forres.

INSECTA SCOTICA.

THE COLEOPTERA OF SCOTLAND.

(Continued from p. 36.)

EDITED BY D. SHARP, M.B.

PUNCTIPENNIS Bris. Rare. Lowland.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

SAGINATUS Sturm. Rare.
DISTRIBUTION—EAST. ♀♂ Forth Tay o o o o o
WEST. o o o o o

UMBRATUS Er. Scarce.
DISTRIBUTION—EAST. ♀♂ Forth Tay o o o o o
WEST. Solway o o o o

SCANICUS L. Lowland, highland. Common.
DISTRIBUTION—EAST. ♀♂ Forth Tay Dee ♀♂ o o o
WEST. Solway Clyde o o o
A pale variety (*C. patruelis* Sturm.) occurs rarely with the ordinary form.

AFFINIS Sturm. Lowland. Rare.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

CELLARIS Scop. Rare.
DISTRIBUTION—EAST. o o o Tay o o o o
WEST. ♀♂ Clyde o o o

ACUTANGULUS Gyll. Rare.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

PARALLELUS Bris. Highland. Rare.
DISTRIBUTION—EAST. o o Tay Dee o o o o
WEST. o o o o o

DENTATUS Hbst. Lowland, highland. Common.
DISTRIBUTION—EAST. ♀♂ Forth Tay Dee ♀♂ o o o
WEST. Solway ♀♂ o o o

BICOLOR Sturm. Lowland. Rare.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

VINI Panz. Lowland, highland. Common.
DISTRIBUTION—EAST. Tweed Forth ♀♂ ♀♂ Moray o o o
WEST. Solway Clyde o o o

HENOTICUS Thoms.

SERRATUS Gyll. Highland. Very rare.
DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o o

PARAMECOSOMA Th.

MELANOCEPHALA Hbst. In flood refuse on the banks of rivers. Abundant.
DISTRIBUTION—EAST. Tweed Forth ♀♂ ♀♂ Moray o o o
WEST. Solway Clyde o o o

ATOMARIA Er.

DILUTA Er. Very rare.
DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. o o o o o

WOLLASTONI Sharp. Very rare.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

NANA Er. Not common.
DISTRIBUTION—EAST. ♀♂ Forth o o o o o o
WEST. Solway ♀♂ o o o

BADIA Er. Very rare. Highland.
DISTRIBUTION—EAST. o o ♀♂ Dee ♀♂ o o o
WEST. o o o o o

ELONGATULA Er. Very rare.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o Clyde o o o

UMBRINA Gyll. Not common.
DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. Solway Clyde o o o

LONGICORNIS Th. Very rare.
DISTRIBUTION—EAST. o o o o Moray o o o
WEST. Solway o o o o

PELTATA Kr. Very rare.
DISTRIBUTION—EAST. o o o o o o o o
WEST. o Clyde o o o

FUSCIPES Gyll. Lowland, highland. Common.
DISTRIBUTION—EAST. Tweed Forth Tay Dee ♀♀ o o o
WEST. Solway Clyde o o o

PUSILLA Payk. Lowland. Not common.
DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. Solway o o o o

ATRICAPILLA Steph. Common.
DISTRIBUTION—EAST. Tweed Forth ♀♀ ♀♀ ♀♀ o o o
WEST. Solway ♀♀ o o o

BEROLINENSIS Kr. Local.
DISTRIBUTION—EAST. ♀♀ Forth o o o o o o
WEST. Solway Clyde o o o

FUSCATA Schön. Common.
DISTRIBUTION—EAST. ♀♀ Forth o o o o o o
WEST. Solway Clyde o o o

MESOMELAS Hbst. Local.
DISTRIBUTION—EAST. ♀♀ Forth o o o o o o
WEST. ♀♀ ♀♀ o o o

BASALIS Er. Very rare.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

APICALIS Er. Rare.
DISTRIBUTION—EAST. o o o o Moray o o o
WEST. o o o o o

ANALIS Er. Local.
DISTRIBUTION—EAST. ♀♀ Forth ♀♀ Dee ♀♀ o o o
WEST. ♀♀ Clyde o o o

RUFICORNIS Marsh. Rare.
DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. Solway Clyde o o o

HISLOPI Woll. Highland. Very local. In dung.
DISTRIBUTION—EAST. o o Tay Dee o o o o
WEST. o Clyde o o o

VERSICOLOR Er. Rare. In dung.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway Clyde o o o

EPHISTEMUS Er.

GLOBOSUS Waltl. Rare. In dung.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway Clyde o o o

GYRINOIDES Marsh. Rather common.
DISTRIBUTION—EAST. Tweed Forth oo Dee oo o o o
WEST. Solway o o o o

LATHRIDIIDÆ.

MONOTOMA Er.

ANGUSTICOLLIS Gyll. In the nests of Formica rufa. Rare.
DISTRIBUTION—EAST. o o o Dee Moray o o o
WEST. o o o o o

PICIPES Hbst. Scarce.
DISTRIBUTION—EAST. oo Forth oo oo oo o o o
WEST. Solway oo o o o

LONGICOLLIS Gyll. Rare.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

M. quadricollis is recorded by Murray from near Edinburgh and Glasgow, but I doubt whether the determination would be correct.

LATHRIDIUS Redt.

LARDARIUS De Geer. Local.
DISTRIBUTION—EAST. oo Forth o o o o o o
WEST. oo oo o o o

NODIFER West.
DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST, Solway oo o o o

RUGOSUS Herbst. Very rare. Highland.
DISTRIBUTION—EAST. o o o Dee o o o o
WEST. o o o o

TRANSVERSUS Ol. Abundant.
DISTRIBUTION—EAST. ♀♀ Forth ♀♀ ♀♀ ♀♀ o o o
WEST. Solway ♀♀ o o o

MINUTUS L. Abundant.
DISTRIBUTION—EAST. ♀♀ Forth ♀♀ Dee ♀♀ o o o
WEST. Solway Clyde o o o

FILIFORMIS Gyll. Very rare.
DISTRIBUTION—EAST. o o o o o o o o
WEST. o Clyde o o o

This is the *L. elongatus* of Murray's Cat., it was found by Mr M. Young "devouring an old Greek author in Paisley."

FILUM Aubé. Very rare.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

Found by Professor M'Nab in the herbarium of the Royal Botanic Gardens, Edinburgh.

CORTICARIA Redt.

PUNCTULATA Marsh. Common amongst hay and straw.
DISTRIBUTION—EAST. ♀♀ Forth. ♀♀ ♀♀ ♀♀ o o o
WEST. ♀♀ ♀♀ o o o

CRENULATA Gyll. Maritime. Local.
DISTRIBUTION—EAST. Tweed Forth ♀♀ Dee ♀♀ o o o
WEST. ♀♀ ♀♀ o o o

DENTICULATA Gyll. Scarce.
DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. Solway ♀♀ o o o

SERRATA Payk. Rare.
DISTRIBUTION—EAST. o o Tay o o o o o
WEST. Solway o o o o

CYLINDRICA Mann. Very rare.
DISTRIBUTION—EAST. o o o Dee o o o o
WEST. o o o o o o

Found at Aberdeen by Professor J. W. H. Trail.

RUFULA Zett. Rare.
DISTRIBUTION—EAST. o o o Dee o o o o
WEST. Solway o o o o

(To be continued.)

LIBRARY

ZOOLOGY.

ON MIGRATION.†

By Colonel H. M. DRUMMOND HAY, C.M.Z.S.

THE following remarks, gathered from different authorities, coupled with observations of my own, made in various parts of the world, have been drawn up more with the view of directing attention to, than with the attempt of throwing any new light on, a subject of which perhaps there is none more wonderful in natural history, or perhaps in the main less understood, than the phenomenon of migration.

Migration, in the strict acceptation of the word, we see to perfection in birds. The case, says Professor Baird, (Am. Jour. of Science, 1866., Ibis. 1867-72,) is quite different with reptiles, and most insects and mammals, of which a few species only change their residence, or leave their place of birth, not in obedience to the instinct of reproduction, but of necessity, caused by overcrowding, the search for suitable food, &c. A true parallel, however, he goes on to say, is seen in the movements of fishes in search of a suitable place to deposit their spawn, which takes place with the same regularity as to date and direction ‡ that we find in birds. This no doubt applies well to America and other parts of the world where great rivers exist, such for instance as the Mississippi, which runs due north and south, and where a fish spawned in the upper waters would have in descending to the sea to pass through many degrees of latitude, and the same on its periodical return to the place of its birth; but in our own rivers and seas, I take it that the movement pertains more to partial, or local, than regular migration, that is to say, the entire quitting of our shores for warmer latitudes, and

† Read before the Perthshire Society of Natural Science.

‡ North and South.

periodical return, like the bird from the sunny south, for the reproduction of young. The herring was once believed to migrate from the extreme north, and to divide into two columns, one of these advancing towards Iceland, and skirting the shores of America, the other taking an opposite direction along the shores of Norway, and furnishing a branch to the Baltic, while a large body spreading out was supposed to visit the coasts of France and Great Britain. It is now, however, pretty well understood that these fish merely retire into deeper water, reappearing at the stated period of reproduction, and never entirely leaving our coasts; and this I believe will apply to the Pilchard, the Mackerel, and many others. The fish which visit our rivers at stated times, such as the Salmon, Salmon-trout, &c., never leave our own shores, but come as it were (if I may so express myself in the case of a fish) inland for the purpose of breeding, much the same as many of our coast birds do in the breeding season, and which may be considered in their case also as merely a local or partial migration.

The Eel, which is also a local migrant, has this peculiarity, that instead of the adult fish ascending our rivers, he *descends* for reproduction, as also to obtain during the winter months a more suitable temperature in the brackish water of the estuary, which is higher in that respect than either pure fresh water or the sea; it being, as the late Mr. Yarrell remarks in his valuable work on British Fishes, a well-known law in chemistry, that when two fluids of different densities come in contact, the temperature of the mixture is elevated for a time, in proportion to the difference in density of the two fluids, from mutual penetration and condensation. Such a mixture, is constantly taking place at the mouths of rivers that run into the sea, and the mixed water maintains a temperature two degrees warmer than that of the river or of the sea. So strong is the instinct of migration implanted in the eel, that in cases where they have been introduced into ponds not having free egress to the brackish water, they have been known to travel over land in the attempt to reach it. Mr. Yarrell quotes a wonderful instance of this mentioned by Dr. Hastings in his "Illustrations of the Natural History of Worcestershire" (p. 134), wherein he states that "a relation of the late Mr. Perrott was out in his park with the keeper, near a large piece of water, on a very beautiful evening, when the keeper drew his attention to a fine eel

quietly ascending the bank of the pool, and with an undulating motion making its way through the long grass: on further observation he perceived a considerable number of eels quietly proceeding to a range of stews or small ponds, nearly the distance of a quarter of a mile from the large piece of water from where they started. The stews were supplied by a rapid brook, and in all probability the instinct of the fish led them in that direction, as a means of finding their way to their ultimate destination, the sea."

Another extraordinary feature in the œconomy of the eel, is the spring migration of the young fry, which, soon after their birth, pass to the upper waters in such compact columns that they have the appearance of a gigantic cable, as I have myself seen in the Shannon, packed so close that anything like numbering would almost be impossible, each of these tiny little creatures not being more than three inches in length, and the passage continuing for many days. Mr. Yarrell also mentions an instance at Kingston-on-Thames in the year 1832 when the passage of eels commenced on the 30th of April, and lasted till the the 4th of May, when it was calculated that from 1600 to 1800 passed a given point in the space of one minute; we may therefore get some notion of the enormous masses assembled during this migration.

With regard to regular migration to and from our shores, there is no doubt that southern fish do visit our coast, but there is no proof that these are not more than mere stragglers, many of them probably finding their way to our seas by following ships, drift-wood, &c., as we know to be the case in many instances; but this is a study on which we require much information, and until we have a few more men living on our coasts willing to devote a little of their spare time and give more attention to matters of Natural History, like the Banffshire naturalist, Mr. Edward, who has done so much in ichthyology and other branches of our land and sea fauna, I fear we shall long remain in ignorance of this interesting subject.

A true parallel with all justice I think may be said also to exist in many of the Cetacea; one especial instance which I will take, is that of the Greenland whale, (*Balæna mysticetus*) which with the same regularity as the swallow comes to Britain, visits the warm seas of the Bermuda Islands, where I have noticed them in large numbers arriving regularly, about the last week of February or the beginning of March,

and remaining till the beginning of June, and sometimes a little later; those frequenting the shallow water being the cow-whales with their young, the bulls probably keeping in the deeper waters outside the reefs. While sailing from Bermuda to Nova Scotia in the month of June, I observed large troops of the blow—or true whale, all heading to the north, no doubt on their way from the Bermudas and the warmer seas. In confirmation of this migration of the whale to Bermuda it may be interesting to quote from Mr. Jones' very entertaining little book, "The Naturalist in Bermuda," the following extract from a letter written by a Mr. Richard Stafford to the Royal Society, nearly 200 years ago, and dated Bermuda, 16th July, 1688: "We have hereabouts very many sorts of fishes. There is amongst them great store of whales, which in March, April, and May, use our coast. I have myself killed many of them. Their females have abundance of milk, which their young ones suck out of the teats, that grow by their navel. They have no teeth, but feed on moss, growing on the rocks at the bottom during these three months, and at no other season of the year. When that is consumed and gone, the whales go away also."

Even some of the Crustacea may be considered in a measure as performing partial or local migration, as for instance those singular creatures the landcrabs of the West Indies and some other places, which by the peculiar formation of their respiratory organs are enabled to live on land as well as water. At certain times of the year they descend from the mountains to the sea, in large bands, for the purpose of depositing their young, and return again to their former haunts when these duties are accomplished.

With regard to land mammalia, though they cannot, as previously stated, be considered true migrants, still we have a very near approach to it in the American Bison, which in large bands traverse nearly the whole length of the North American continent, returning again in their due season; this movement however is regulated by the supply of food, necessary to maintain the vast herds which inhabit the Prairies, and not for the reproduction of their young. From their rapid decrease however, and wanton destruction by the hand of man, these animals may in time, from reduced numbers, completely alter their habits. In Lapland we see, on the other hand, the little Lemming, not much bigger than a mouse, at certain times moving, it is said, in such large armies that the whole face

of the land seems absolutely covered with their vast hordes, not even rivers or lakes checking their onward course, and few, if any, ever returning to their native homes. A wonderful invasion or irruption appointed to serve some mysterious purpose of nature! Similar phenomena may be seen in insect life, the locust, the butterfly, cockchafer, and many others, advancing in vast hosts, some in the embryo state, others in that of the fully developed insect, devastating whole districts in which they may chance to appear.

I shall not, however, dwell further on this subject, but revert to migration as we see it so truly depicted and forcibly brought before us in the study of ornithology; not a season, scarcely a month passes by, but what the most superficial of observers may detect some change in the bird-life around him. The anatomy and structure of the bird, so wonderfully adapted to his requirements in the medium through which he travels, enables him to traverse with comparative ease over regions of the globe, with a speed not to be excelled by any other creature. Every part of the frame is formed for lightness and buoyancy. The bones are all hollow, and so formed as to assure the maximum of strength combined with the minimum of weight; the body clothed with the softest plumage, the wings of the lightest material, and yet endowed with strength to strike with a force sufficient to impel a body of many pounds' weight through the air with astonishing rapidity. The internal structure also is wonderfully adapted for the same purpose; "the lungs placed close to the back bone and ribs, the air entering in by a communication through the wind-pipe, (which in many cases is elaborately formed) passes through and is conveyed into a number of membraneous cells, which lie upon the sides of the pericardium, and communicate with those of the sternum, these cells continuing down the wings extend even to the pinions, thigh bones, and other parts of the body, which can be filled and distended at pleasure. The feathers even, and especially those of the wings and tail, contain quantities of air."† This wonderful diffusion of air through the body in birds, is not only essential to buoyancy and floating power, but also to the supply of the extra heat necessary for the high elevations and amount of speed to be attained; birds being endued, as it is well known, with a larger supply of caloric

† Bewick; Introduction, vol. I.

than other animals; and it is observed, that in birds enabled to take the highest and longest flights, such as the Condor of South America, Vulture, Eagle, &c., this extention or diffusion of air is carried further than in others, being regulated according to the requirements of the species.

This is especially exemplified in the formation of the Man-of-War or Frigate-bird (*Tachypetes aquilus*) of the tropics, whose prodigious spread of wing, in comparison to the size and lightness of the body, together with the slender forked tail, gives it not only a superiority in speed, but from the large proportion of caloric with which it must be supplied, a power of suspension enabling it to attain a height perhaps unequalled by any other bird; however rapidly the various gulls and terns, or even the Tropic or Boatswain bird (*Phäeton æthereus*) move on the wing, it is to it a mere matter of sport to overtake and rob them of their prey, with a flight so swift, that it has been said that he might with ease secure his breakfast in Africa and his dinner in America. It has been computed, says Mr Gould, that our swallow has a speed equal to about 90 miles an hour, and that should this be a just computation, that of the Alpine Swift must be twice as great, but that is nothing compared to the Frigate-bird. A French author,* but I know not with what authority, states that the former bird has been computed to accomplish 80 leagues an hour, equal to 240 miles. Even with the lesser speed of the swallow, which can cover a space of a thousand miles in the course of ten or twelve hours, migration seems trivial, in comparison to those who seemingly have neither strength nor expanse of wing to perform the same, such as the willow-wren, and hosts of others, who yet fearlessly hasten onwards. We may well be astonished, if we only consider the resolution, the power, that must impel them to undertake this tremendous journey, to be accomplished twice every year, traversing seas, crossing mountains, through every diversity of climate, encountering dangers of every kind, till after reaching the northern shores of Africa, and resting awhile, proceed, some to remain in the vicinity, some to occupy the cooler regions of the Atlas, some to winter in the warmer climate of Southern Morocco, and others venturing even to cross the great Sahara itself, and after resting perhaps for awhile on some friendly oasis, finally reaching the more fertile plains of the black man. A few

* Michelet. "*L'Oiseau.*"

months pass, and the whole host returns—again to encounter similar dangers.

Season after season, year after year, this wonderful ebb and flow of migration continually rolls on, not in these parts only, but, on both sides of the Equator, and in every portion of the globe does this law prevail; sufficient to make a man pause, and think of the mighty works of the Creator, and imbue him with a sense of the Supreme Being's great wisdom, power, and beneficence to the weakest of His creatures, who are enabled without guide, without compass, nevertheless with unerring certainty, to find their way to their distant homes. Even were the route handed down from generation to generation, and the old birds to pilot their young back to the very spot of their birth, it would be wonderful enough; but when we take into contemplation that the old birds, as soon as the renewal of their primaries after the first moult will admit of it, take their departure and leave their young to follow as best they may, and that the newly fledged nestling, urged by some wonderful instinct, should undertake this journey of hundreds of miles, without the guidance of their parents, on whom one would have supposed the whole responsibility of their safe conduct would have rested, and yet reach in safety their final destination, it is marvellous indeed. Neither, it is said, do the young return in spring with their parents, nor go so far north as the old birds; but these points I purpose touching on hereafter.

Not only is it the gift of flight, but the wonderful sense of sight with which a bird is endowed, and the great faculty of memory—call it instinct if we will—which enables him with unerring precision to make the land, the very headland perhaps from which he started months before. While some proceed directly inland to the place of their birth, others will trace their way along the coast from headland to headland, one, perhaps, recognising some stream up which he ascends, and taking a distant hill or some well-known object as a guide, finally wings his way back to the very spot, it may be the very nest, he left the autumn before, and here patiently awaits his mate, who follows him in the course of a week or ten days. The fact of the males preceding the females is well known to take place in most of our summer visitants. In juxtaposition to this, in the case of the woodcock, on the authority of Mr. Selby, the first flights in autumn are composed almost entirely of females.

That birds do return to their former place of abode has been proved in numerous instances to be a fact beyond doubt, and one author* records that the Swallow, by means of certain marks, has been known to take possession of the same nests for eighteen summers in succession. The late Mr. Saxby, with reference to the Corn Bunting, a winter visitant in Shetland, affirms "that the same flocks visit the same localities year after year for several winters in succession, and that an individual having a large white mark on the back appeared at Halligrath with the first flocks as regularly as the year came round"†; and Mr. Gould, in his magnificent work on the Birds of Great Britain, so graphically, and so beautifully brings before us the return of the little Spotted Flycatcher to the same spot year after year that I cannot resist the temptation of quoting it:—"As the Wheatear," he says, "is the earliest of our spring wanderers, so is the Spotted Flycatcher the latest. May is generally far advanced before its upright form may be seen on the railing before our window; yesterday it was not there, this morning it has made its appearance as suddenly as if it had dropt from the clouds, or descended from the heavens. With the tamest of dispositions this solitary mute may be seen perched on some elevated position from morning to night; here it watches any passing insect, and when his full black eye detects one he likes, he sallies forth with a graceful flight, captures it with a snap of its broad mandibles, and returns again to its accustomed perch. Supposing it to be as late as the middle of May before the Spotted Flycatcher commences its nesting duties, there will still be time for it to rear one or two broods, which will have acquired sufficient strength before fly-life is extinct, to perform a migration over the sea to the distant land of Africa, in the northern part of which country both adults and young spend the winter, and intuitively retrace their steps in the ensuing spring. The pair which built their nest over the door post, or against the cherry tree of the garden wall, return again, should no accident befall them, to the very spot, to greet and to be greeted once more. Surely it needs but a moment's thought, but a moment's consideration, to regard these little travellers with interest. Let us contemplate for an instant the distance they have travelled, the journeys they have

* Pouchet. L'Univers. † Birds of Shetland, p. 95.

performed; how from the Scottish Border, they have passed over England to the coast of Sussex, thence sped their way across the Channel to Spain, and onwards to the shores of the Mediterranean; where nothing daunted, they have braved the elements, and finally reached the opposite shore; no bark has wafted them across the Straits, no compass guided them; instinct alone points out the route they are to pursue."

The return of birds annually to the same spot is one of the numerous inexplicable facts which we see in migration, and which would seem to be due also to other causes than the mere fact of birth; for Mr. Gray (Birds of West of Scotland, p. 92) mentions that in the belief that migratory songsters return to their native haunts, Sir John Sinclair of Ulbster some years ago attempted the introduction of nightingales into Caithness, by obtaining numbers of nightingale's eggs from the neighbourhood of London, and placing them in robin's nests. Though all were safely reared, and seen flying about in the vicinity of their birthplace, they, in obedience to their migratory instincts, quitted their northern home in September, and were never afterwards heard of, and perhaps, he adds, they were right. Might not this non-return be owing to a natural weakness of constitution in the nightingale, and its inability to endure the cooler and more sunless counties of the north, for we know that great numbers of summer visitants to these islands do not cross the Tweed, not even crossing the Tyne, or rarely so, while on the continent birds extend their migrations to latitudes higher than the northern parts of Scotland. Why is this? Certainly not for the want of suitable food, for of that there would be abundance.

As the northern parts of the Continent are much colder in winter in comparison to Britain, driving birds many degrees south of what they go in this country, so may it not be that from a larger share of sun in summer, than in these sea girt lands, they go farther north than they do with us; and this is conspicuous in the Nightingale, the Wryneck, red-backed Shrike, and many others, the former not going in these islands higher than five miles north of York,* though found in Sweden and Russia.† Does not this seem a proof that the apparent susceptibility of heat and cold in different birds affects in a great measure the extent of their migration. Some naturalists

Yarrell, vol. I. 2nd. ed., 304. † Gould's Birds of Great Britain, vol. II.

affirm that the failure of food necessary to different kinds of birds is the great stimulant to migration, and upon which it solely depends; others again, that it is the want of light, and that the sun alone governs their motions. True, but it is the combination of these; or in other words, the seasonal changes from the earth's position, in relation to the sun, either increasing or diminishing the peculiar food on which they subsist, as well as those constitutional causes above alluded to, which compel them, according to the season of the year, to seek the climate most suited to their wants, not only for themselves but for their tender progeny, requiring a temperate climate and the necessary caterpillar food, without which they could not subsist, and which, had the parents remained in their winter quarters, could not have been obtained in sufficient supply, as most grubs and caterpillars would by that time have changed into a perfect state. Besides which, as is the case in many of our waterfowl, the impulse implanted in them of reaching a place of refuge far from the haunts of man, where they can in safety rear their young, urges them on with irresistible power to the extreme wilds of the North, from whence they return in countless myriads to replenish the earth.

Birds are especially affected by the extremes of heat and cold, and any one who has lived in warm countries may have noticed the total absence of bird-life during the great heat of the day; not a note, not a sound is to be heard, but that of the monotonous and never ceasing chirp of the cicada insect, which seems to glory in the heat. The cool of the evening and sun-rise, however, tells a very different story; the woods and groves then resound with life.

On the other hand, many of our summer birds of passage are most susceptible of cold, and Mr. J. H. Gurney gives an instance of this in the case of the Swallow * even so far south as Algeria. "On the 26th and 27th of March," he states, "we experienced at Laghouat a very cold wind; so benumbed were the poor swallows, that hundreds might have been killed with stones. The poor birds were to be seen sitting about in all directions." And he goes on to say "I am inclined to think they were suffering from cold, rather than from the want of insect food. Insect life seemed to me to be always abundant." This susceptibility of cold, is frequently to be noticed in our winter

* Ibis. 1871, p. 74.

migrants, as also among our resident birds. Mr. Gould mentions a remarkable instance of this in Cornwall, from whence Mr. E. H. Rodd, writing to him from Penzance, under date of Jan. 8th 1867, says "I foresaw that there was hard weather somewhere, although the thermometor never shewed a greater amount of frost than one degree; for sixty miles to the eastward, the reading was nine degrees above zero, and the next day only five. The heavy weather to the eastward has driven millions of Linnets, Starlings, Larks, Redwings, Fieldfares, Peewits, and Golden Plovers to this district." And Mr. Gould, who was at the time on a visit to Lord Falmouth at Tregothnan, says that the destruction of these birds was immense; that he himself saw lying dead on the frozen snow, hundreds of Starlings, Song-Thrushes, Missel-Thrushes, Redwings, and Fieldfares, but none of the Common Blackbird. Some of our winter migrants have not the constitutional hardiness of others; thus the Redwing often quits this neighbourhood during the winter months, proceeding further south; while its congener, the Fieldfare, generally braves out the severest of our winters.

Some birds though hardy enough never to leave us in winter, and thereby becoming residents, are forced on the Continent where the cold is much greater, to become migratory. Thus the Blackbird, the Robin, the little Golden-crested Wren, and many others have to perform a regular migration, even crossing the Mediterranean to the shores of Africa. The late Capt. Sperling, R. N., mentions his having met the Robin crossing the Mediterranean in three or four instances *:—one on its northern migration from Africa April 11th, at 30 miles distant from the coast of Sardinia, the nearest land; two on their southern migration on the 1st Oct. the nearest land being 105 miles from the Island of Zante, with a north-westerly breeze, which would land them probably in a few hours on the coast of Tripoli; and lastly, another on the 12th of September, also on its southern migration, 55 miles from the coast of Sicily. The Rev. Canon Tristram, of whom we may safely say there is not a more observing ornithologist and no better authority, says, in his remarks on the Ornithology of Palestine (Ibis 1865, p. 75.) "It may be observed that those species which have the most extended northerly, have also the most extended southerly range; and that those which resort to the highest latitude for nidi-

* Ibis 1864—p. 290.

fication also pass further than others to the southward in winter. Thus the migratory Fieldfare, visiting regions north of the limits of the Thrush and Blackbird, on their southward migration, leave their more sedentary relatives behind. The Brambling, which passes the Chaffinch in Norway, leaves it also in Europe, and crosses the Mediterranean every winter to the Barbary States. The Egyptian and Collared Turtle-doves remain throughout the year in Syria and north Africa, but the Common Turtle (*T. auritis* Temm.) so abundant in those countries in summer, never leaves a straggler behind in November, and yet in spring advances a thousand miles nearer to the Pole than they do.

Though this is one of those laws of migration so little understood, we have a very striking exception to it in the Snow Bunting *(Plectrophanes nivalis)*, bearing on the theory that constitutional causes in some measure influence the extent of migration in birds. The Snow Bunting never much exceeds the limits of the central parts of Europe on its southern migration, there only being three instances of its being found so far south as Malta * (and I have seen no record of its ever having been noticed in Africa); and yet the Wheatear, who goes equally far north, nesting almost side by side with it far within the Arctic circle, goes into the interior of Africa, and is never found in Europe in winter. While to the westward, Canon Tristram found it in the Sahara (Ibis, 1859, p. 300); to the eastward, Mr. S. Allen (Ibis, 1864, p. 238) says, it does not even winter so far north as Egypt, but goes into the interior of Nubia, not returning to Egypt till the beginning of March. Mr. Cavendish Taylor and Mr. Shelley mention the same fact (Ibis, 1867, p. 61, and 1871, p. 51). Why is this? The Wheatear, though insectivorous in its habits, would no doubt get a sufficiency of food suitable to it in the extreme south of Europe, or northern Egypt, during the winter, but being of a more delicate constitution than the Snow Bunting, is compelled to seek a warmer climate. The Snow Bunting, again, is granivorous; but so is the Brambling. The former, strong and robust in habit, is enabled to stand our winters with impunity, some few even wintering as far north as Shetland; the latter winters in many parts of this country, but never in Shetland; and on the continent it

* Ibis.

proceeds, as has been above stated, as far south as Africa, leaving the Chaffinch behind it. Though I have said that food is not the sole cause of migration, yet that birds do, in some miraculous way, discover the existence of particular kinds of food suited to them, and make a sudden descent on some particular locality where it is unusually abundant, let it be ever so distant, is an undoubted fact.

Thus, in the year 1593, which was said to be a great apple year, immense flights of Crossbills visited the orchards in England, and the following is an extract from a quaint old account mentioned by Bewick :—"In the apple season of this year an immense multitude of unknown birds came into England, and though the fruit was pretty well ripened, they entirely neglected its pulp, swallowing nothing but the pipins. Nobody had seen such birds, or had heard of them from the oldest persons ; and what in them is chiefly to be admired, they were so tame, and gentle, and innocent, that they seemed to have flown hither from some desert wholly uninhabited by man. They suffered themselves patiently to be attacked by slings and cross-bows, never thinking of flying off, till some of them, stricken by stones, or apples, or leaden bullets, fell dead from the trees. Finally, whether they came in quest of the food they lived upon or not, as soon as the apples were gone they all disappeared, but no one knows whither they went."

In the year 1838, a most wonderful year for the super-abundance of cones on the spruce trees, we were visited in the Carse of Gowrie by hundreds of Crossbills, and many were seen in the following year, but not in such numbers. I have never seen them in the same locality since, or have I ever again noticed the cones to be anything like in the same quantities as they were that year. Mr. Cordeaux, in his Birds of the Humber district, mentions two other instances, of the Brambling *(Fringilla montifringilla)*: "During the winter of 1860-61, when the Beechmast was so plentiful, hundreds of these birds visited the neighbourhood of Swinhope, and that large flocks also arrived in the neighbourhood of Beverley in the autumn of 1864, in which year there was likewise an abundance of Beechmasts ;" and there are many instances of the same nature regarding other birds on record.

The arrival and departure of birds of passage, though sometimes almost to a day in the former, is not always so regular in the latter, both being much influenced by the weather and

atmospheric changes. The swallow, especially, has been known to prognosticate in a wonderful manner the coming storm, in anticipation of which they have suddenly taken their departure "*en masse*" before their appointed time, and I am sorry to say sometimes in doing so leave their unfledged nestlings behind them to starve; it may sometimes be that, inveigled by a fine autumn, they may attempt the rearing of another brood, which they have not time to do. But be this as it may, this bad trait in their character extends to most of the swallow kind; the Swift has been known to come back to its old nest the following year, and coolly chuck out the skeletons of its deserted children to make room for a fresh brood; some even do not take this trouble, but merely put a few fresh feathers in as a lining, allowing the new generations contentedly to sit on the top of their dead brothers and sisters.

M. Michelet† mentions a very remarkable instance of this presentiment of coming danger, and sudden departure: "When living at Nantes, in October 1851, the season being still exceptionally fine, the insects numerous, and the feeding ground of the swallows plentifully provided, it was our happy chance to catch sight of the sage republic convoked in one immense and noisy assembly, deliberating on the roof of the Church of St. Felix. Why was the meeting held on this particular day, at this hour, more than at any other? We did not know; but soon after we were able to understand it. Bright was the morning sky, but the wind blew from La Vendée. Gradually the weather grew cloudy. The sky assumed a dull leaden grey, the wind sank, all was death-like. It was then, at about four o'clock, that simultaneously arrived from all points, from the wood, from the Erdre, from the city, from the Loire, from the Sêore, infinite legions, darkening the day, which settled on the church roof, with a myriad voices, a myriad cries, debates, discussions. Though ignorant of their language, it was not difficult for us to perceive that they differed among themselves. It may be that the youngest, beguiled by the warm breath of autumn, would fain have lingered longer. But the wiser and more experienced travellers insisted upon departure. They prevailed, the black masses moving all at once, like a huge cloud, winged their flight towards the south-east, probably towards Italy. They had scarcely accomplished three hundred

† L'Oiseau.

leagues (four or five hours' flight), before all the cataracts of heaven were let loose to deluge the earth. Sheltered in our house, which shook with the furious blast, we admired the wisdom of the winged soothsayers, which had so prudently anticipated the annual epoch of migration. The morrow would have been too late. The insects, beaten down by the tempests of rain, would have been undiscoverable; all the life on which they subsisted would have taken refuge in the earth."

(To be continued.)

THE LEPIDOPTERA OF MONCREIFFE HILL.

By Sir THOMAS MONCREIFFE, Bart.

(Continued from page 46.)

Hepialus hectus.—This insect is not very common at Moncreiffe, perhaps easily overlooked. I have beaten the males in the day time out of the lower branches of trees standing in the open meadows, and taken them on the wing in the evening.

H. lupulinus.—Not common at Moncreiffe. I have never taken this insect here above 120 feet, but I have taken *hectus* up to 500.

H. humuli.—Not so common as formerly, probably on account of increased drainage; usually met with on the moist ground towards the base. I have noticed it, however, up to 175 feet above sea level. One evening my son observed a male settle on the leaf of a horse-chesnut tree fully 20 feet from the ground; by getting on my shoulders he shook it into his net. I am not aware if they usually roost so high.

H. velleda.—This is a most puzzling species, and I cannot but think that we include more than one form that we take here under the name of *velleda*. It is excessively numerous along the base of Moncreiffe Hill, and wherever the bracken grows, up to about 550 feet above the sea level. The ♂ ♂ vary in size from 1″ 3‴ to 1″ 6‴. The ♀ ♀ from 1″ 6‴ to 2″ 1‴. The smallest ♀ I have has the ground colour of a dirty white, and is, in general appearance, not unlike Hubner's Fig. 21, *Carna*, but front-wing a little more produced, and not quite so pointed at the tip. This was taken *in cop.* with a male (size 1″ 3‴),

marked somewhat like the male of *lupulinus*. The fringes of the posterior wings of the ♀ are interrupted at regular distances by dark spots, as in the usual forms of *velleda;* those of the ♂ are unicolorous. I have another female exactly similar to that above described, and both were taken in the same place, near, but not among bracken, in a damp spot, at rest upon some herbage growing amongst rushes. On 29th June, and several subsequent days, in 1871, I observed a good many of the largest class of females at rest on the boles of some ash-trees, at an altitude of about 200 feet, on the northern border of a bed of bracken. I only kept three or four specimens, unfortunately, and I have seen none exactly the same since. They *all* measured from 1″ 10‴ to 2″ 1‴, and were mostly unicolorous, or very faintly marked, the tracings being very slightly paler than the ground colour, which approached to Herrich Schæffer's Fig. 4, var. *velleda*, but of not quite so red a tinge. I have one male almost identical with H. S.'s Fig. 4, also scarcely so red. Others again are very *rosy*-red (the legs brightly so), varied with white and yellow, like the common form (see Hubner's Fig. 212), which has nearly the same markings, but ground colour browner. *Velleda* flies from about June 11th into July.

H. sylvinus is a fairly common insect at Moncreiffe, but local. I have not observed it above an altitude of 175 feet that I am aware of. It is common on a dry bank, among mixed herbage and bracken at this altitude, and I have seen it taken resting on tansy by the river side. Hubner's Fig. 207, of *Hamma*, which Staudinger calls *sylvinus*, is like the males we have here, but is too highly coloured; the females are more like Hubner's Fig. 211, *Flina*, which Staudinger calls *lupulinus*.

With reference to the pendulum flight of the male *humuli*, noticed in the *Entomologist's Monthly Magazine*, No. 147, page 63, it will be seen that Dr. Chapman builds upon it a theory of natural selection in this species, and reasons that it may be an "explanation of its remarkably small antennæ, compared with those of the 'sembling' *Bombyces*, in which the male finds the female by an antennal sense, analogous to smell." Now, I can answer for it, that this is not the case with *velleda*, which is structurally the same as *humuli* in regard to the antennæ. The female of *velleda* rests upon some low plant, and keeps up a perpetual vibration of the wings, until one of the males, which are hunting about, discovers and alights upon her, when

copulation instantly takes place; the male then suspending himself from the female, when the vibration of her wings as instantly ceases. I took a pair and detached them, the male making no signs of life, but rolling about in the box as if he had ceased to exist. And so he remained until I took him home, and placed him in the Cyanide bottle, when he died after a kick or two. I think the hovering of the male of *humuli* may be more reasonably compared to that of the kestrel hawk when in search of food, and probably he selects some spot in which to watch for the female, which his instinct tells him is likely to be selected by her, though of course other senses than that of sight may be brought into use to effect his object.

Harpyia furcula.—I have never taken this insect myself, but Mr. Herd takes both the larva and perfect insect off willow at the south-western base of Moncreiffe Hill, up to an altitude of about 150 feet, where he tells me it is of moderately frequent occurrence.

H. vinula.—The larva of this insect is common wherever willows and poplars grow, on the sweet-scented tacamahac, as well as on the white poplar and aspen. I have taken the full fed larva wandering across a mown grass lawn, fifty yards from its food plant.

Notodonta ziczac.—I only know of one specimen of this insect having been taken at Moncreiffe, and that was an imago found at rest on a rock face by Mr. Herd, at an altitude of about 400 feet.

Drymonia chaonia.—I am inclined to think that this insect is not uncommon at Moncreiffe, and is probably generally distributed. I found a pupa under moss lying so near the surface, that my attention was attracted to it by seeing it shining in the sun through the moss. It was under a spreading oak, and was from 12 to 15 feet from the trunk. There is no oak copse on Moncreiffe Hill, and most of the oaks are high-branched trees, so that it is difficult to discover the larva of the oak-feeding species. Mr. Herd took a specimen on May 1st; I found one on the 24th April, on an oak trunk, at 10 a.m., and another I found dead on the branch of a spruce, which was overtopped by an oak. It had apparently died a natural death, and was in splendid condition. These were taken in 1874-1875.

Leiocampa dictæoides.—Mr. Herd has taken the larva of this

species at Moncreiffe on birch, and I have reared one fine specimen from a larva found by him. *Dictæa* also occurs in the immediate neighbourhood, but not within the precincts of which I am treating.

Lophopteryx camelina is a common insect on Moncreiffe Hill, from 100 feet upwards. It varies considerably in shades of colour, from light brick to dark red brown. It appears in May and June.

Peridea trepida.—I bred a fine female of this insect from a larva beaten off oak, at an altitude of 300 feet, in 1874, the only time it has been recorded as occurring here, I believe.

Pygæra bucephala.—The larva of this moth was common here at one time, I am told, and was very destructive to the foliage of the trees which it attacked. Since I commenced collecting, however, in 1870, it has been scarce, and I have not even been able to obtain a set. I can give no reason for its disappearance.

Dasychira pudibunda.—I reared a specimen of this insect in 1870, but as I did not know the larva by sight, and was rearing other larvæ at the time, which my son had brought from England, I cannot be quite certain that I gathered the larva of *pudibunda* at Moncreiffe. Although it is my firm opinion that I did so, I shall omit it in the meantime. I think it will prove to be resident here yet, as I feel confident I saw one on the wing on another occasion.

Porthesia chrysorrhœa.—When not out collecting at night, I am in the habit of sitting with my study window open, and the gas burning as brightly as I can make it, keeping a good look-out for visitors. The only specimen of *P. chrysorrhœa* which has been taken anywhere in this locality landed on the middle of my writing-table, on the night of the 28th of June, 1872. I just managed to bang down the window in time to prevent his departure, as he did not seem to like his quarters. Where this specimen can have come from is a mystery to me, as if the insect breeds anywhere in the neighbourhood, Mr. Herd or I would most probably have ferreted it out. It is very curious how instances occur of occasional specimens being taken in a locality where they are not known to occur again.

Gnophria rubricollis.—This is an insect which appears to have departed from among us without good cause. Mr. Herd used to take it on Moncreiffe Hill 10 years ago, and Dr.

Buchanan White tells me he took larvæ there a good many years ago. It has not been observed, I believe, since. May the change of climate, which has certainly affected the less hardy cultivated plants of late years, have something to do with it? This change has been chronicled from time to time by some of our most observant gardeners and others, and indeed within my own memory, large crops of figs used to ripen on the open wall in my garden, and now scarcely one ever comes to maturity.

Nola confusalis is common at Moncreiffe on trunks of trees, usually oak.

Nola cucullatella.—Rare; has been taken by Mr. Herd.

Nemeophila plantaginis.—Locally common, from 600 feet to the summit. I fancy the males during their wild flight in the afternoons are searching for the females before they emerge. At least I have found that the males occasionally settle and hunt about in particular spots among the heather, &c., and after taking a turn over the ground, return again after a certain time to the same spot. Sometimes I have marked more than one place that they return to in this way, and by sitting quietly and watching them, observe that they always make a regular round. I cannot say I have *proved* it to be the case, but their manner is so very much like that of a male insect when he is aware of the presence of an unimpregnated female, that I mention my observations in case they might be verified by some other entomologist.

Spilosoma fuliginosa.—Common, though not so generally distributed as formerly. Burning the furze brakes and wild uncultivated pieces of ground in the neighbourhood, and pasturing them with sheep, has thinned their numbers in this locality, I think. Our Scottish form is darker, and not nearly so bright an insect as the southern.

S. menthastri.—Common on the lower part of the Hill, and comes freely to light in my study. Varies from dark cream colour to almost white in the fore wings, and is curiously variable in the number of spots on the hind wings, ranging from 1 to 4,—in one specimen there are 8 or 9. There is a perfectly formed elbowed line of confluent spots across the fore wings of my darkest specimen, as well as a second line formed in the same way, which almost gives it the appearance of having a distinct fascia across the centre of the wings.

Euchelia jacobææ has been taken here, but I believe it was introduced, and I think has now disappeared.

Bombyx rubi.—Locally common, at an elevation of about 600 feet. Mr. Herd is very successful in rearing this insect, his plan being to expose the larvæ to their natural climate in the open air through the winter.

Pœcilocampa populi.—Not common. I reared a female last year, and kept her for a night in my study, to allow of her wings being properly dry, as I had not got a specimen for my cabinet. Curiously enough, the only other specimen I have (a male), I found outside the window frame next morning. He surely cannot have discovered that there was a lady inside the room, shut up in a box!

22. Smerinthus populi; *c*
23. Acherontia atropos; *v r*
24. Sphinx convolvuli; *v r*
25. Deilephila galii; *v r*
26. Chærocampa porcellus; *c*
27. Macroglossa stellatarum; *r*
28. ,, bombyliformis; *r*
29. Trochilium bembeciforme; *f*
30. Hepialus hectus; *f*
31. ,, lupulinus; *f*
32. ,, humuli; *c*
33. ,, velleda; *c*
34. ,, sylvinus; *c*
35. Harpyia furcula; *r*
36. ,, vinula; *c*
37. Notodonta dromedarius; *f*
38. ,, ziczac; *v r*
39. Drymonia chaonia; *r*
40. Leiocampa dictæoides; *r*
41. Lophopteryx camelina; *c*
42. Diloba cæruleocephala; *c*
43. Peridea trepida; *v r*
44. Pygæra bucephala; *r*
45. Demas coryli; *c*
46. Orgyia antiqua; *c*
47. Porthesia chrysorrhæa; *v r*
48. Gnophria rubricollis; *v r*
49. Nudaria mundana; *c*
50. Nola confusalis; *c*
51. ,, cucullatella; *r*
52. Arctia caja; *c*
53. Nemeophila plantaginis; *c*
54. Spilosoma fuliginosa; *c*
55. ,, menthastri; *c*
56. Bombyx rubi; *c*
57. Pœcilocampa populi; *r*
58. Platypteryx falcataria; *c*

NOCTUÆ.

Thyatira batis.—Fairly common at sugar. I have observed more specimens at sugar after midnight than earlier.

Cymatophora duplaris.—Not uncommon among birch in certain localities, up to 600 feet. Varies a good deal in the shade and intensity of coloration. In some specimens the light-grey ground colour prevails, in others it is almost completely obscured by the dark-stone colour, of which the central

shade is usually composed. This insect appears to ascend to the higher branches as speedily as possible after emerging from the pupa. At least on one occasion I intercepted a fine female running up the bole of a birch, the wings being still moist and flaccid, and I have never observed one at rest on the trunk.

C. flavicornis.—Not uncommon. The earliest record of this insect being taken at Moncreiffe is March 6, 1872, and I mention the circumstance in order to encourage young collectors in their separate districts. Being a beginner myself, as it were, in those days, I was in quest of information, and asked Dr. Buchanan White if he could assist me in my endeavours to obtain specimens of the Lepidoptera of the district, by suggesting *something* to look for. He said *C. flavicornis* ought to occur here on the birches. I pointed to a spot where the birches were always early, and said will you come and look for it? He acquiesced, and off we started. We had not examined more than two or three trees, when I found a specimen clinging to the trunk at a foot from the ground, about 3 p.m., since which time I have observed that *flavicornis* usually emerges here after mid-day, as I have examined trees before that time without result, which have afforded newly risen imagos later in the day. This is a more refined looking insect here than in Rannoch, where it abounds. In the Moncreiffe specimens the costal margin for two-thirds of its length, the discoidal spots, and the lines, have a beautiful yellow tint, which is entirely absent in the Rannoch specimens.

Bryophila perla.—Common at the park wall, at an altitude of about 50 feet. Dr. Buchanan White and I, when looking for land-shells, found the larvæ under loose fragments of a trap rock at an altitude of 500 feet. Comes to light.

Acronycta psi.—Common everywhere up to 200 feet. I have not observed it above that altitude. Mr. Herd tells me that he finds the larva of *A. tridens* feeding commonly along with that of *psi*. I cannot say that I can distinguish the difference in the imagos.

A. ligustri.—Common at sugar in July. I have not observed it over 300 feet. Our specimens are darker than those from the south.

Leucania conigera.—Common at sugar and at ragwort blossom, and particularly attached to the blossom of woodsage (*Teucrium scorodonia*).

L. lithargyria.—I have taken this species commonly, flying at blossom and also at sugar. It varies in shades of colour, some specimens being of a dark, rich tawny hue, others much paler.

Of the *Leucaniæ*, *conigera*, *comma*, and *pallens*, ascend to 600 feet, the other two *(impura* and *lithargyria)* attaining a much lower elevation. They all come to light.

Nonagria fulva.—I only know of one locality for this species, at an elevation of a little over 400 feet. The type here is not so dark fulvous as in the south, although specimens occur of a ruddy wainscot. The usual form is pale ochreous. This is one of those insects which had either escaped observation, or has made its appearance in the last two or three years. It is now plentiful in the spot where it occurs.

Gortyna flavago.—I have never seen the imago of this insect in the wild state, although the larva is abundant in the stems of thistles, nettles, ragwort, and *Angelica sylvestris*, a proof that many of the Lepidoptera may be overlooked, and an incentive to the student of entomology, as well as to the collector, to study the life history of the objects of his research. Mr. Herd bred them last year from the young shoots of elder, in which the larvæ were burrowing.

Hydræcia nictitans is abundant everywhere, and may be taken both by day and night on the blossoms of the ragwort, which grows in profusion on those parts of Moncreiffe Hill which are not too thickly wooded. It varies considerably in size and shades of colour, from bright-chesnut to tawny-brown. In some specimens the orbicular, and also the claviform stigmata are peculiarly distinct. I cannot find that the latter has been noticed in the descriptions of this insect. It comes freely to light.

H. petasitis.—Rare. I know of only three specimens having been taken at Moncreiffe, and we have not been able to discover the larva. One of my specimens came to light, another I took on ragwort blossom at night, and Mr. Herd took a third by day on the wall of his house. It probably feeds here on dock, as there is no *Petasites* near.

H. micacea.—The type here is almost identical in colour with *petasitis*, and I have found it difficult to obtain rosy specimens. It is common and generally distributed, comes freely to light and sugar, and is partial to flowers, especially ragwort.

Xylophasia polyodon.—Abundant at sugar, at light, and at blossom. Varies considerably in size and colour, many specimens approaching to black, some rosy brown, and others pale-mouse colour.

Heliophobus popularis.—Locally common. I have taken it occasionally at ragwort blossom, and it comes commonly to light in my study. The female is less frequent than the male. I have not seen it above 200 feet, and never took it at sugar.

L. cespitis. — Common, particularly at light in my study; also partial to ragwort blossom, and occasionally at sugar.

Mamestra anceps.—Rare. I have one specimen found roosting in an old rug, which hung on a fence near my keeper's house.

M. furva.—Rare. I have one specimen which came to sugar in my garden in 1871.

Apamea gemina.—Some seasons this moth is very common at sugar, but appears to be rather locally distributed. In some specimens the two black dashes from the base, which Mr. Stainton gives as one of the characteristics by which this insect may be distinguished, are totally absent. We have dark, pale, and intermediate varieties.

A. unanimis.—Rare. Mr. Herd has taken this insect. I have specimens which might be this species, but they are doubtful. I see that in Newman's "Natural History of British Moths," he describes it as larger than the preceding species—*A. gemina.* Is this ever the case?

Miana strigilis.—Not uncommon, particularly on ragwort, and I have seen no varieties.

M. fasciuncula.—Common some seasons, at sugar and ragwort blossom. We have a variety here which puzzles me much, in which the ground is of a yellow-clay colour. It is curious that this variety is constant, at an altitude of a little over 600 feet, in which locality I seldom, if ever, meet with the red variety, which occurs principally at an altitude of about 200 feet, and is much more scarce. I have always doubted the two varieties being the same species. One of my specimens has a decided indication of a light-coloured line, following the shape of the hind margin across the centre of the posterior wings, as in Herrich Schaeffer's Fig. 179, of "Airæ." The general appearance of the insect being somewhat the same,

and which Dr. Staudinger, in his catalogue, refers to *arcuosa*. Surely there is some mistake here?

Acosmetia arcuosa.—Not uncommon in one spot, where the food plant grows. Does not appear to vary.

Caradrina blanda.—Abundant. *Alsines* may occur, but although I have specimens which might be attributed to that species, I prefer omitting it.

Rusina tenebrosa.—Common at sugar, at ragwort blossom, and comes freely to light; varies in intensity of shade. Occurs up to 700 feet.

Agrotis suffusa.—Rare. Comes to light.

A. clavis (= *segetum*).—Abundant some seasons. Varies considerably in size and markings, and also in the shade of ground colour. This moth must wander considerably, as I have taken it in the woods at sugar, at an elevation of 600 feet. It is very partial to rhododendron blossom, and I have remarked that this insect, as well as *exclamationis*, as soon as they alight on the trusses of blossom, crawl inside and feed at the base of the blossom, differing in this respect from others of the noctuæ, which feed in the blossom like bees. It is curious to see the numbers which are whizzing about, and yet become invisible almost as soon as they alight, owing to this habit of crawling about in the heart of the trusses.

A. corticea.—Not uncommon. I have taken this insect in the same localities as *segetum*, up to 600 feet.

A. nigricans of late years has been very abundant and excessively variable, both in the shades of ground-colour and in the intensity and colour of the markings. In some specimens the latter vary little from the former in the shade, in others the lines and other markings are of a beautiful glossy-yellow. Some have the subterminal line composed of yellowish-white dots, while in others again it is entirely absent. *A. nigricans* is particularly partial to ragwort blossom. It occurs at all altitudes.

A. obelisca.—This insect is abundant on Moncreiffe Hill, from 100 feet upwards. It also varies in size and in the intensity and form of the markings. Here again the subterminal line and wedge-shaped marks accompanying it are sometimes wanting, although the general contour of the insect is unmistakeable. I have taken it at sugar, but more commonly on heather and ragwort blossom. I think it has increased considerably in the last two years.

A. porphyrea.—Locally common. It is partial to the blossoms of heather and woodsage, and also comes to sugar.

A. lucernea.—Rare. Have taken it on heather blossom.

Triphæna orbona.—Common. Varies considerably in the colour of the fore-wings. I have one specimen as red as *interjecta*. *T. subsequa* has been reported from Moncreiffe Hill, but I have never seen a specimen. Some specimens of *orbona* have a dark brown blotch on the costa at the commencement of the subterminal line, which I think has caused the mistake.

Noctua glareosa.—This insect was common in 1870 at sugar and on phlox blossom in my garden, since which it has transferred its attention to ragwort and sugar at a much higher level, indeed nearly to the summit. Probably, owing to the absence of wild flowers, it had come down in search of food, as I have seen few or none in my garden since. It is plentiful where it occurs. Comes to light.

N. depuncta.—Not uncommon, but rather local. To be taken most seasons at ragwort, and occasionally at sugar.

N. plecta.—Abundant where it occurs. At an elevation of 100 to 150 feet, and extending over about a linear half-mile of ground, I have seen them absolutely swarming at dusk in the opens when the wild hyacinth, ground ivy, &c., are in blossom. Comes also to sugar occasionally. Sometimes, when it has been getting too dark to net them, I have lighted up, but have never been able to see one after the lantern was lighted. Whether they drop to the ground or go up into the trees I have never discovered. I have also taken this species at rhododendron blossom, not in the heart of the truss, like agrotis, but in the flower, like a bee.

N. ditrapezium.—Common and pretty generally distributed. Particularly partial to ragwort blossom. Varies slightly in size and in bloom, but is otherwise very constant in markings, &c. Its numbers do not seem to depend upon altitude, as it is to be found wherever the ragwort blossoms most freely. I have taken it also on the flowers of the woodsage *(Teucrium scorodonia)*, and occasionally at sugar, and at light in my study.

N. triangulum.—Not common. Comes to sugar and light. A larva of this moth, which I had in my cage, burrowed into a log of rotten wood to undergo its transformations.

N. rhomboidea.—Not so common; but we take it every

season in the same manner and in the same localities as *N. ditrapezium*. It is, however, more difficult to obtain perfect specimens, as it is usually a little rubbed before coming to blossom. I do not understand why this should be, unless it flies more among the trees and bushes than its neighbours, and indeed I have always found it more partial to the ragweeds which grow under the trees than to those which grow in the open.

N. brunnea.—Common at sugar and ragwort blossom. I found the larva of this moth in abundance in 1872 on a bed of *Scrophularia vernalis*, at an elevation of about 400 feet, which, I think, must have been damaged considerably, as it has almost disappeared from the spot since.

N. festiva.—Is common, particularly at sugar, at an elevation of 600 feet. It is variable, but not so much so here as in Glen Tilt, where I have taken very rich varieties. I cannot say I have ever taken *conflua*, although I have small *festiva*. By the way, why is it called *conflua?* I imagined at one time it was because the discordal spots were confluent, but I see by Herrich Schaeffer's figures that this is not the case.

N. dahlii.—Common at all altitudes, and comes freely to sugar and ragwort blossom.

N. rubi.—Not uncommon, but local. I find it here in two places at the extremes of altitude. In one near the river, at an altitude of 30 feet or less, the other at an altitude of 600 feet.

N. neglecta.—Rare. Both varieties occur here. I have taken this moth on heather and ragwort blossom and at sugar above 200 feet. I have not seen it in the lower ground.

N. xanthographa.—Is most abundant and most variable in every respect. In some specimens the superior wings are almost black, and from this shade they vary down to pale-rosy or cinnamon. I have one specimen very like a pale *rubi*. The posterior wings in some cases are yellowish-white with a narrowish, dark grey border, and from this they pass through all the shades of grey, till they lose the lighter portion altogether and become one uniform dark brownish-grey. It varies also slightly in size.

(To be continued.)

SOME NOTES ON THE BRITISH SPECIES OF OPORABIA.

By F. BUCHANAN WHITE, M.D., F.L.S.

HAVING recently had occasion to examine a large series of the moths belonging to the genus *Oporabia* Stph., I purpose giving here a short account of the result of my investigations.

In the earliest catalogue of British insects to which at present I have access, viz., Curtis' "Guide," published in 1829, one species only—*dilutata*—is mentioned, and given as the type of an unnamed new genus.

In the next work before me—Humphreys and Westwood's "British Moths," vol. ii., 1845—a second species is given, but erroneously referred to *polata* Hb.

Westwood, in the revised edition of Wood's "Index Entomologicus," gives, in addition to *dilutata*, *filigrammaria* and *autumnaria*, to the latter of which he refers the *O. polata* of his "British Moths."

In the list of "New British Species of Lepidoptera since 1835" in the "Entomologist's Annual" for 1855, are the following remarks by Mr. Stainton, the editor, pp. 41, 42 :—

"*Oporabia autumnaria* Boisd., enumerated as British in Doubleday's Catalogue, at p. 18. Its capture is recorded by Mr. Weaver in the 'Zoologist' for 1852, p. 3495. 'It rests on the branches of birch. I captured a few specimens in Perthshire in 1851, and found it very sparingly in previous seasons.' Mr. Weaver says—'This species is readily distinguished from *O. neglectata* and *dilutata* by the glossy silver and fineness of the wings, and the slenderness of antennæ.' For my own part, I have never been able to satisfy myself that it was specifically distinct from *O. dilutata*. *Oporabia neglectata*, which is also noticed by Mr. Weaver in the "Zoologist," at p. 3496, and is enumerated as a distinct species in Stephen's "Museum Catalogue," but I am not aware that its claim to be considered a species has yet been satisfactorily established.

"*Oporabia filigrammaria* Boisd.; the capture of this species in this country was first recorded by Mr. Edleston, in the "Entomologist," at p. 356, under the name of *O. polata*, under which name it is figured and described in Humphreys and Westwood's "British Moths," vol. ii., p. 56, pl. lxix., fig. 9. Many specimens have been taken in the north of England and

Scotland, and the species is in most collections. The *Oporabia approximaria*, and *precursaria*, mentioned by Mr. Weaver, at p. 3496 of the "Zoologist," are probably varieties of this species."

We find in Stainton's "Manual," vol. ii., 1859, the three species given as distinct, and briefly characterised.

In Newman's "British Moths" (1869), *dilutata* and *filigrammaria* are described, but *autumnaria* is not mentioned.

In Knaggs' and Stainton's "Cabinet List" (1870), the three species appear, but it is suggested that possibly *autumnaria* Gn. is a variety of *dilutata*.

Finally, in Doubleday's Catalogue (with Supplement 1873) *dilutata* and *filigrammaria* appear as species, but *autumnaria* is given as a synonym of *filigramaria*, thus—"*Autumnaria* Dbl. Cat. var.? *non* Bdv."

Turning now to Staudinger's "Catalogue" of the European Lepidoptera (1871), we find the species under consideration catalogued thus:—

2642. DILUTATA (S. V. p. 109 n. Cat.) Bkh. v, 290; Hb. 188; Tr. vi, 2.26; Wd. 639; Gn. ii, 262; (aria) Frr. 408.426, 2.3; *Impluviata* Bkh. v, 291; *Inscriptata* Don. Nat. Hist. xv, T. 517; *Fimbriata* Hw. p. 320.

a. ab. *Obscurata*; *Dilutata* Dup. viii, 205; (aria) Frr. 426, 4 (al. ant. fere unicolor. nigro-fuscis, al. post. sæpius infuscatis).

b. v.? (et ab?) *Autumnata* Gn. ii. 264, Pl. 18.7; ? Bkh. v. 293.565; ? *Quadrifasciata* Bkh. v, 294.564. (al. albicantibus, minus pictis.)

2643.? FILIGRAMMARIA H.S. 194-5, III, p. 160; Weaver Zool. 1852, p. 3495; Wd. Suppl. 1728; Gn. ii., 265; *Approximaria*, Weaver Zool., 1852, p. 3495 ab; *Precursaria* Weaver l. c. ab; ? *Affiniata* Bkh. v. 294.564. (præcedentis varietas an species Darwiniana?)

a. ab. *Autumnaria* Gn. ii. 265; *Polata* Westw. Br. M. ii., 56. T. 68, 9 (*non* Hb.) (major, dilutior.)

From the foregoing it would appear that British Lepidopterologists seem at present to incline to the opinion that there are only two British species, while Dr. Staudinger rather doubts whether there be more than one. I may here mention that the late Mr. Doubleday, in a letter to me, shortly before his death,

expressed his belief that there was probably a third distinct species.

Let us now see on what grounds the three supposed species were separated. In Stainton's "Manual," where the descriptions, though short, are generally very much to the point, the three are thus described :—

O. DILUTATA. 1″4‴-1″7‴. F.-w. pale grey or whitish grey, with numerous transverse, wavy, darker lines and bands; frequently a central pale band between two dark bands, the outer of which is followed by another pale band; central spot indistinct blackish. September (end), October.

O. AUTUMNARIA. 1″4‴-1″5‴. F.-w. more glossy than in *Dilutaria*, the second line more angulated near the costa; f.-w. a trifle more pointed than in *Dilutaria*, and rather smaller. August.

O. FILIGRAMMARIA. 1″1‴-1″3‴. F.-w. narrower and more pointed than in *Dilutaria* (especially in the female), pale grey, with numerous transverse, wavy lines, forming a darker central band (or at least the edges of one); central spot black; h.-w whitish, with pale grey hind-margin. August (end), September.

Moreover he adds that *filigrammaria* is much smaller and *autumnaria* much more glossy than *dilutata*, though all three are "very closely allied."

In Newman's "British Moths," *filigrammaria* is said constantly to differ from *dilutata* "in being of less size, and in having the forewings narrower and considerably more pointed."

Not having at present access to Guenée's "Phalénites," I cannot refer to his descriptions.

My own investigation I began by trying if I could find any structural differences by which the specific distinctness, or the reverse, of the supposed three species could be proved; and in the male genital armature I have found such differences.

On the ventral hind-margin of the last abdominal segment of a male *Oporabia* are two short spine-like processes. In *dilutata* (Pl. I. A Fig. 2 and 3) these are rather near each other and form short spines, longitudinally striate near the tip. In *autumnaria* (B Fig. 2 and 3) they are rather farther apart and less distinctly spine-like, while in *filigrammaria* (C Fig. 2 and 3) they are much flatter and little more than tooth-like projections of the hind-margin. Again, the lower margin of the harpagones in

dilutata (Pl. I. A Fig. 4 and 5) is distinctly and sharply toothed, while in the other two species the same part of the harpago is merely angulated.

It is evident, therefore, that *dilutata* is most decidedly a species distinct from the other two. In them there is a great similarity of structure, but the difference in formation, which I have pointed out above, though slight, seems to be constant, and taken along with other differences, appears to show that *autumnaria* and *filigrammaria* are both good species, and such I have little hesitation in pronouncing them to be.

It will be observed, of course, that this structure exists only in the males, and that some other points must be found, not only by which the females may also be separated, but by which all specimens can be determined without dissection. I therefore give descriptions of each of the species.

O. DILUTATA. F.-w. scarcely glossy, greyish-white, more or less distinctly tinged with *brown*, with numerous transverse, wavy, darker lines and bands; second line indistinctly and roundly angulated near the costa; central spot usually very indistinct in the male, more distinct in the female; h.-w. scarcely glossy, whitish with a brown tinge, and with one or two indistinct lines parallel to the hind margin.

Expanse of the wings in the ♂ 34-41 mm. (16-19 lines), in the ♀ 34-36 mm. (16-17 lines). A series of measurements resulted as follows:—four specimens 34 mm., four 36, two 38, one 40, and one 41.

Any variation in colour that I have seen is rather towards a paler form, and a less decided brown tinge. I have seen no infuscated specimens.

O. AUTUMNARIA. F.-w. distinctly glossy, slightly more pointed than in *dilutata*, greyish white with a *silvery-grey* tinge, with numerous transverse, wavy, darker lines and bands; second line more distinctly and acutely angulated near the costa; central spot usually distinct but sometimes rather obscure by the space between it and the second line being infuscated; h.-w. glossy, whitish, with a silvery-grey tinge, hind margin frequently with a more or less distinct broad pale grey band.

Expanse of the wings in the ♂ 34-40 mm. (16-18½ lines), in the ♀ 35-41 mm. (16-19 lines). A series of measurements gives this result:—one specimen 34 mm., one 35, four 36, five

37, six 38, three 40, one 41. The average size is rather larger than in *dilutata*.

Autumnaria varies sometimes with the ground colour of the front-wings infuscated, the markings remaining however tolerably distinct.

O. FILIGRAMMARIA.—Very like *autumnaria*, but smaller; f.-w. with hind margin apparently more concave near anal angle (where it is slightly concave in all the species), and hence the tip more produced; markings more suffused; h.-w. with marginal band often more distinct and darker.

Expanse of the wings in the ♂ 32-36 mm. (15-17 lines), in the ♀ 28-33 mm. (13-15½ lines). A series of measurements gives two specimens 28 mm., one 30, four 31, one 32, three 33, one 34, two 35, and one 36. *Filigrammaria* appears thus to to be a smaller species than *autumnaria*, with, especially in the ♀, narrower wings. In *autumnaria* the sexes are nearly equal in size, in *filigrammaria* the females are usually much smaller than the males. In variation of colour there is a tendency to a somewhat greater suffusion of the markings.

Regarding the larvæ of these species much remains to be discovered. That of *dilutata* is well known, but of *filigrammaria* scarcely, and of *autumnaria*, not at all. I hope therefore that any one who can obtain eggs will send them to Mr. W. Buckler (Lumley House, Emsworth, Hants), that the larva may be described and figured.

Regarding the time of appearance of the moths, it has been said that *autumnaria* appears in August, *filigrammaria* at the end of August and in September, and *dilutata* at the end of September and in October. In my own experience I have never seen any *Oporabia* till well on in September, but Sir T. Moncreiffe has shown me specimens of *autumnaria* taken at the very beginning of September, so that it is very possible for it to appear in August, and it is probable that it always appears earlier than *dilutata*, though both fly together.

As to the distribution of the species, *autumnaria* seems to be, in the north at least, almost as common as *dilutata*, but *filigrammaria* appears to be much less widely distributed, and in Scotland, as far as my experience goes, rather a scarce species. When collectors however have learnt to know them better the range of the various species will be more accurately ascertained.

Of the figures of the species that I have seen, Hubner's fig. 188, is *dilutata*, but the central spot too distinct; Wood's 639

(not 693 as cited by Staudinger) is *dilutata* and 1727 a very fair figure of *autumnaria*; Humphreys and Westwood's pl. 68, fig. 7, appears to be *dilutata* ♀, fig. 8 a pale variety of *dilutata*, and fig. 9, though referred by Westwood to *autumnaria*, is probably *filigrammaria*, but not good; Herrich Schaeffer's fig. 194-195, *filigrammaria*; and in Newman's British Moths the upper fig. 239 is *dilutata*, and the lower may be *autumnaria*, though the angle of the second line is rather too rounded; the figs. of *filigrammaria* (240) are not bad, though scarcely (especially the upper one) showing the concavity of the hind-margin of the front-wing.

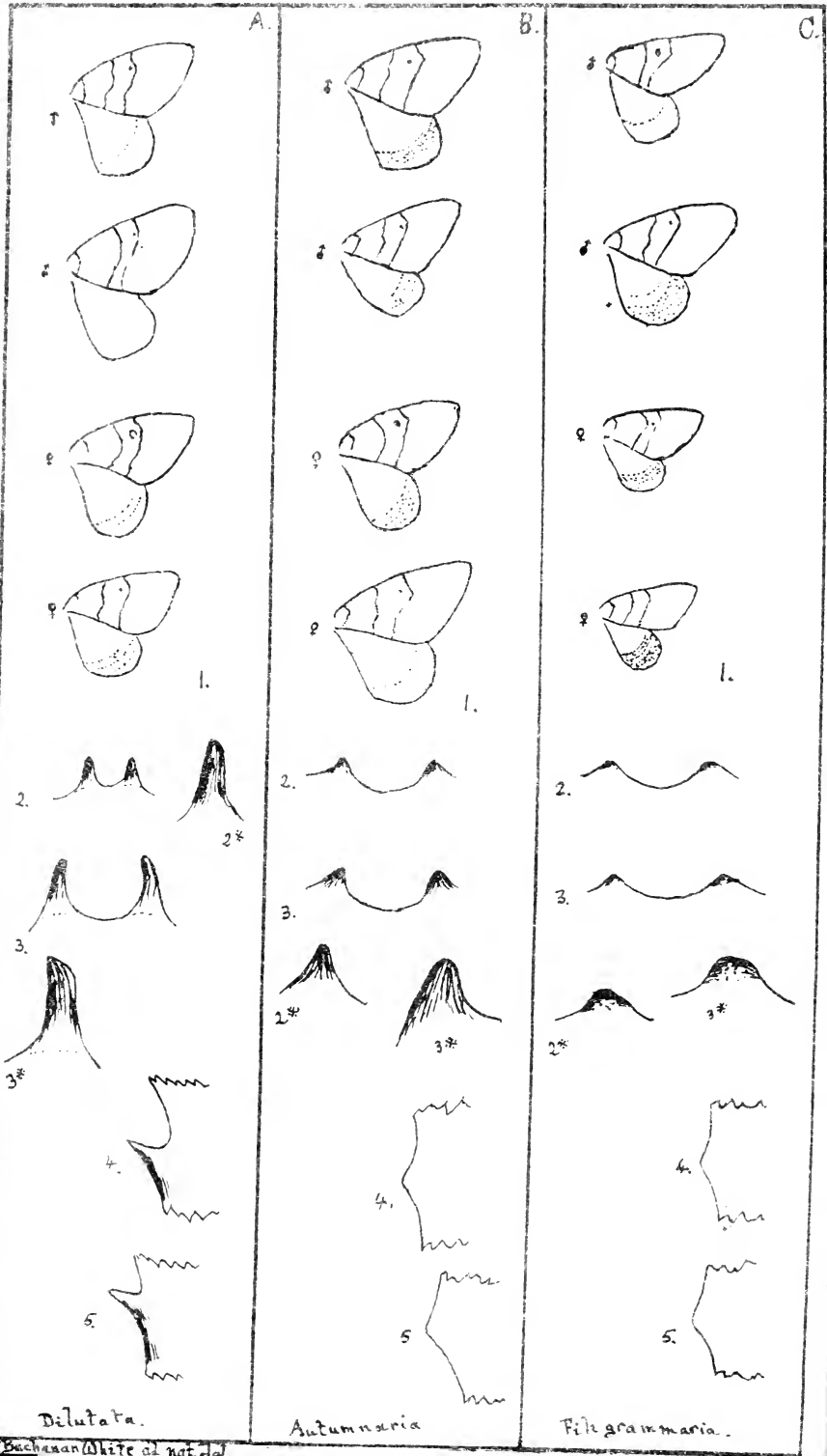
EXPLANATION OF PLATE I.

1. Diagrams of the shape of the wings and of the 2nd line of the front wing in *Oporabia*.
2. Processes on ventral hind-margin of last abdominal segment. 2* A process more highly magnified.
3. . . . . from another individual. 3* A process more highly magnified.
4. Part of lower margin of one of the harpagones.
5. . . . . from another individual.

Waste of life at St. Abb's Head.—The year before last, lots of Guillemots and Razorbills were caught in salmon-nets at or near St. Abb's Head. What a pity this slaughter could not have been prevented. Whether they were drowned or not when the fishermen found them I do not know, but it is true that they were used to manure the land. I hear from a friend that a great many are not unfrequently caught in nets at Plymouth, and brought into harbour alive, and that he sometimes buys them merely for the purpose of letting them go again. What a pity there is not some one equally patriotic at St. Abb's Head.—J. H. GURNEY, Jun., Northrepps, Norwich.

Extermination of Rare Animals.—Mr. Harvie Brown's contribution on the above is valuable, but it goes in some respects too far, and in some not far enough. It goes too far as respects my communication. I certainly communicated to you the fact that *F. milvus* still habitates close to Blair Castle; but in the same communication I say that it is "a pity, especially as their food is reptiles and mice, that gamekeepers are exterminating them." Regarding their habitat at Blair Athole, as the Duke has plenty of keepers, I don't think there is much chance of any outsiders invading the locality. "Keeper" in Latin is *custos*: and *the* question is: *Quis custodes custodiet?* The subject concerns many other animals than the Kites, e.g., *Felis catus*, now nearly exterminated by gamekeepers.—W. HERDMAN, Rattray, 10th May, 1877.

Capture of Vanessa Antiopa.—On the 5th of last April, Mr. John M'Gregor caught a very fair example of *Vanessa Antiopa*, a few miles from Perth. The specimen, which appears to be a ♀ is interesting as having probably hibernated in this country. If not captured it might possibly have deposited eggs.—F. BUCHANAN WHITE.


A.
B.
C.
♂
♂
♀
♀
1.
2.
2*
3.
3*
4.
5.
Dilutata.
Autumnaria
Filigrammaria.
J. Buchanan White ad nat. del

Colias Edusa in Galloway.—To-day I captured here a specimen of *Colias Edusa*, flying along the shore. It is in excellent fresh condition, considering the time of year ; and was strong on the wing.—W. D. ROBINSON DOUGLAS, Orchardton, Castle-Douglas, June 7th.

Colias Edusa is just now out all round Dumfries (that is in both Dumfriesshire and Kirkcudbrightshire). I captured a pair on the 9th inst., and it has been seen singly, and in twos and threes, all over the district. It is very strange we missed it in August and September last, as it would probably be in much larger numbers then. It has not been seen here for the last ten years—the duration of my entomological experience, but Mr. Lennon, of the Crichton Royal Institution, informs me, that some thirteen years since it was abundant near Annan, about sixteen miles south from here. I trust this beautiful butterfly will take up a permanent abode with us.—ROBERT SERVICE, Dumfries, June 1877.

Colias Edusa in Berwickshire.—A splendid specimen of *Colias Edusa* has been taken, and others seen, in Berwickshire in the beginning of June.—W. SHAW, Eyemouth, June 1877.

Colias Edusa in Perthshire.—I saw a specimen of *Colias Edusa* here a few days ago. Though, unfortunately, I did not succeed in catching it, yet I was so near it as to be able to see the markings very distinctly.—W. HERD, Scoonie Burn, near Perth, June 1877.

Alternation of generations in the Cynipidæ.—We take the following note from the "Petites Nouvelles Entomologiques," (Vol. 2, p. 142, June 15, 1877). M. J. Lichtenstein has communicated to the Entomological Society of France, the result of very curious observations made by Dr. Adler, of Schleswig, upon Hymenoptera of the family *Cynipidæ*. The females only, as is well known, of many genera of this family have been found, but from Dr. Adler's observations it would appear that the species of these genera are only transitory forms *(formes transitoires)* of other species of which both sexes are known. It is by means of a true parthenogenetic alternation of generation that the reproduction of these insects is effected. This discovery presents a new and large field of study for entomologists, and will cause a revolution in the nomenclature of the *Cynipidæ*. The form and structure of the two forms is so different that they have been placed in different genera. As an example of the metamorphosis M. Lichtenstein mentions *Spathegaster baccarum* which comes from the well known fleshy "Currant-galls" of the oak, and of which both the male and female are known. The ovipositor is short, and from the pricking of the young leaves by it results a small lentil-shaped gall (one of the spangle-galls) from which comes the *Neuroterus lenticularis*, a species of which only the female is known, and of which all the individuals are females. In the *Neuroterus* the ovipositor is long, and the eggs are laid in the buds of the oak, the result being the formation of the Currant-galls, and the consequent production of *Spathegaster baccarum*. Dr. Adler is stated to have proved this metamorphosis in five other species.—F. BUCHANAN WHITE.

PHYTOLOGY.

Notes on Abnormal Plants.—During a visit to Ardencaple Wood in the early part of May this year, I came across one of the most remarkable forms of the primrose which I have seen. The peculiarity consists in the development of five narrow petaloid segments which alternate with the lobes of the corolla. These narrow segments are not organs simply adherent to the inner surface of the corolla tube like metamorphoid stamens, but the bases form a continuous sheet of tissue with the petals. At first sight the abnormality appears to resemble the "doubling" of the primrose often seen in cultivation. In the ordinary double primrose, however, the additional petaloid lobes are metamorphoid stamens, and are opposite to, not alternate with, the lobes of the corolla. In this abnormality the superadded petaloid pieces are simply interpetaline lobes, analogous to the intersepaline lobes often seen in the calyx of *Campanula media*. One of the most interesting points connected with this is, that in the order *Primulaceæ* we have a genus in which interpetaline lobes naturally occur. In this abnormal primrose we have then a deviation which imitates, so to speak, the normal condition of an allied genus. Recently, one of my students brought me two other abnormal specimens of the common primrose. In the one the flower-stalk was elongated, so that we had the flowers situated upon a stalked umbel, instead of, as is the usual form, having them sessile. Besides this all the separate flowers had the outer floral envelope or calyx transformed into a yellow body resembling the true corolla. The other variety had two separate corollas upon each flower-stalk, one in the inside of the other, like the different parts of a telescope. In this form, the calyx was of its normal shape and colour, otherwise the flower resembled the first variety, where the calyx was coloured as in the corolla. Besides this peculiarity, in both of the corollas were five well developed stamens; but on dissecting the flower, I found only one pistil, and this had been transformed into a leafy organ like what is often seen in the double cherry. Two years since I gathered, in the island of Cumbrae, some peculiar varieties of the common daisy (*Bellis*) In the one form the large white ray florets, instead of being strap-shaped or ligulate and female, were tubular and neuter. In the ordinary double daisy the flowers are all ligulate and female. The other variety had a number of separate heads all springing from the same stalk, as in the hen and chicken daisy of the garden. In the same place I gathered specimens of the *Chrysanthemum leucanthemum*, *C. segetum*, and *Matricaria inodora*, in which the ray florets had become large and tubular with a total loss of reproductive organs. I have also plants of *Scabiosa succisa* and *Matricaria inodora*, in which the heads of the flowers were enlarged like the hen and chicken daisy. Specimens of the latter of these plants were placed in the Glasgow Botanic Gardens, and in the summer of the following year the capitula had all their flowers metamorphoid like the hen and chicken daisy. At first sight the plant might have been mistaken for an unbelliferous plant. In the early part part of this year I gathered a specrmen of the marsh marigold (*Caltha palustris*) in Possil Marsh, in which the leaf that subtended one of the flowers had been transformed into a petal.

Examples of this abnormality are often seen in the tulip, where the leaf below the flower is more or less like one of the petals. Since then I have obtained a similar abnormality in the *Anemone nemorosa*, where one of the bracts below the flower had been transformed into a petal.—R. H. PATERSON, 6 Windsor Place, Glasgow.

Notes on Lathræa squamaria.—This peculiar plant has made its appearance on the banks of the Clyde below Carmyle, after an absence of nearly 20 years. The plant was first found there by the late Professor Roger Hennedy, in the spring of 1855. It appeared on the same spot for the next three years, when it was lost sight of till this year, when I came across it in one of my class excursions. The plant has been found growing recently in several other places around Glasgow, *e.g.*, in Campsie Glen, on the roots of hazel, and in Ardencaple Wood, on the roots of the dog's mercury.—*Id.*

Rare Plants from Ben Lomond.—During an excursion to Ben Lomond this year, I again came across specimens of the moss *Leucobryum glaucum* in fruit on the same spot as I found it last year. When near the summit of the hill, I came across several specimens of *Draba incana* in flower. This plant has never been reported for the valley of the Clyde.* Last summer on going down one of the steepest parts of Ben Lomond along with a friend, I came across several interesting and rare plants, among which may be mentioned *Sesleria cærulea*, *Tofieldia palustris*, *Alsine verna*, *Cerastium alpinum*, *Cherleria sedoides*, *Potentilla salisburgensis*, and *Polystichum lonchitis*. The last five are new to the district.—*Id.*

Alchemilla conjuncta Bab.—As it has been doubted if Mr. A. O. Black found this plant in Scotland, it may be as well to put his exact direction to the place on record. I copy from my Herbarium a note in his hand. "The exact station is about 300 feet from the base of the Glen Doll side of Craig Rennet, Clova, on the left-hand side of the first *large* ravine which comes down from Craig Rennet on entering Glen Doll. I only saw one patch of it, but that a very large one, about 8 or 10 feet square. Aug. 1853.—*A. O. Black.*" The specimens are fine and have, as I think, a few minute bits of mica sticking to them, although they have been very carefully washed. Dr. M. Tyacke, M.D. (now of Chichester), gave me specimens from "Glen Sannox, Arran, 1832." They are, I fully believe, the true plant. No other botanist has found it there or at Clova: but it well deserves a careful search in both places.—C. C. BABINGTON, in *Journal of Botany*, June 1877.

CRYPTOGAMIC SOCIETY OF SCOTLAND.

The Annual Meeting will be held at Dunkeld on October 9th, and following days. It is purposed to have a small show, more especially of the local fungi. Any botanists, though not members of the Society, desirous of taking part in the proceedings, will be cordially welcomed.

Further particulars may be learnt on application to the Secretary, DR. F. BUCHANAN WHITE, Perth; or the local Secretary, MR. JOHN DUFF, Banker, Dunkeld.

* *Vide* Sc. Nat. IV. p. 51.—Editor Sc. Nat.

INSECTA SCOTICA.

THE LEPIDOPTERA OF SCOTLAND.

(Continued from p. 34.)

EDITED BY F. BUCHANAN WHITE, M.D., F.L.S.

HYBERNIA Latr.

DEFOLIARIA Cl. Not very common. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee ♀ o o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40′-57°. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. October, November. LARVA. May, June. FOOD-PLANT. Trees and shrubs.

MARGINARIA Hb. (1794); *progemmaria* Hb. (1800?). Common. Agrestal and nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ ♀ o o o
WEST. Solway Clyde ♀ o o

LAT. 54°40′-56°30.′ RANGE IN EUROPE. Central. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. February-April. LARVA. June. FOOD-PLANT. Hawthorn, beech, and other trees.

AURANTIARIA Esp. Not uncommon. Nemoral. Ascends to about 1000 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee ♀ o o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40′-57°. RANGE IN EUROPE. Central; (Sweden?). TYPE. Central. TYPE IN BTITAIN. British.

TIME OF APPEARANCE—IMAGO. October-December. LARVA. May, June. FOOD-PLANT. Birch, &c.

LEUCOPHÆARIA Schiff. Common. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee ♀ o o o
WEST. Solway Clyde o o o

LAT. 54°40′-57°. RANGE IN EUROPE. Central; (Sweden?). Type. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. February-April. LARVA. May, June. FOOD-PLANT. Oak.

RUPICAPRARIA Hb. Common. Agrestal.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ ♀ o o o
WEST. Solway Clyde o o o

LAT. 54°40′-56°30′. RANGE IN EUROPE. Central. Type. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. January-March. LARVA. May, June. FOOD-PLANT. Hawthorn, &c.

Many of our specimens agree with the ab. *ibicaria* H.S., 511, which is simply darker, and occurs in France, &c.

CHEIMATOBIA Stph.

BRUMATA L. Abundant. Hortensal, agrestal, nemoral. Ascends to 1400 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀
Orkney o
WEST. Solway Clyde ♀ ♀ ♀

LAT. 54°40′-59° RANGE IN EUROPE. Central and northern. TYPE. Septentriono-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. October-December. LARVA. May, June. FOOD-PLANT. Trees and shrubs.

BOREATA Hb. Common. Nemoral. Ascends to 1700 feet.

DISTRIBUTION—EAST. Tweed ♀ Tay Dee Moray o o o
WEST. Solway Clyde ♀ ♀ ♀

LAT. 54°40′-57°50′. RANGE IN EUROPE. West central. TYPE. Occidento-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. October-December. LARVA. May, June. FOOD-PLANT. Birch.

LOBOPHORA Curt.

POLYCOMMATA Hb. Rare. Nemoral.

DISTRIBUTION—EAST. o o o o o o o o
WEST. o Clyde o o o

LAT. 56°15′. RANGE IN EUROPE. Central; (Finland, &c.) TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. April, May. LARVA. June, July. FOOD-PLANT. Ash and honeysuckle.

I have seen no Scottish specimens of this or *L. viretata*.

HALTERATA Hufn. (1769); *hexapterata* Schiff. (1776). Local. Nemoral. Ascend to 1200 feet.

DISTRIBUTION—EAST. ♀ ♀ Tay Dee Moray Sutherland o o
WEST. o o o o o

LAT. 56°10′-58°40′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. July. FOOD-PLANT. Aspen, poplar, and sallow.

CARPINATA Bkh. (1794); *lobulata* Hb. (1803). Not uncommon. Nemoral. Ascends to 1300 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40′-57°50′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. April. LARVA. June, July. FOOD-PLANT. Sallow, &c.

VIRETATA Hb. Rare. Nemoral.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. Solway Clyde o o o

LAT. 55°56′-15°. RANGE IN EUROPE. Central; (Finland, &c.) TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. July, August. FOOD-PLANT. Privet, ash.

OPORABIA Steph.

DILUTATA Bkh. Common. Nemoral. Ascends to 1800 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde ♀ West-Ross ♀

LAT. 54°40′-57°50′. RANGE IN EUROPE. Northern and central. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. September-November. LARVA. May, June. FOOD-PLANT. Various trees.

AUTUMNARIA Gn. Probably not uncommon. Nemoral. Ascends above 1000 feet.

DISTRIBUTION—EAST. ♀ Forth Tay Dee ♀ ♀ o o
WEST. ♀ ♀ ♀ ♀ ♀

LAT. 56°-57°. RANGE IN EUROPE. Britain, France, Germany. TYPE. Occidental. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. August-October. LARVA. May, June. FOOD-PLANT. Birch?

For remarks on this species see *Sc. Nat.*, IV., p. iii.

FILIGRAMMARIA HS. Not common. Nemoral, ericetal. Ascends to above 1300 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. ♀ Clyde ♀ [West Ross] o

LAT. 55°40′-57°40′. RANGE IN EUROPE. Britain; ? N. Lapland. TYPE. British. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. September, October. LARVA. May, June. FOOD-PLANT. Sallow, &c.

VENUSIA Curt.

CAMBRICA Curt. Local. Nemoral.

DISTRIBUTION—EAST. ♀ ♀ Tay ♀ ♀ o o o
WEST. [Solway] Clyde Argyle ♀ o

LAT. 56°-57°. RANGE IN EUROPE. Britain, Switzerland, Norway, Finland, Altai, &c. TYPE. Occidento-alpine? TYPE IN BRITAIN. British?

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August, September. FOOD-PLANT. Mountain-ash.

LARENTIA Tr.

DIDYMATA L. Common. Nemoral and ericetal. Ascends to 2500 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray Sutherland Orkney ♀
WEST. Solway Clyde ♀ West-Ross ♀

LAT. 54°40′-59°. RANGE IN EUROPE. Central and northern (but not general). TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. Larva. May, June. FOOD-PLANT. Many low plants.

MULTISTRIGARIA Hw. Common. Agrestal, nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40′-57°40′. RANGE IN EUROPE. Britain, Holland, Central and South France, and Catalonia. TYPE. Occidento-meridional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. March, April. LARVA. May, June. FOOD-PLANT. Low plants.

CÆSIATA Lang. Common. Ericetal. Ascends to about 3000 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray Sutherland Orkney ♀

WEST. Solway Clyde Argyle West-Ross ♀

LAT. 54°40′-59°. RANGE IN EUROPE. Northern, Alps, Britain, Belgium, &c. TYPE. Septentriono-alpine. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-September. LARVA. August-June. FOOD-PLANT. Heather and low plants.

FLAVICINCTATA Hb., *ruficinctata* Gn. Local. Alpine and sub-alpine. From 500 to 3000 feet.

DISTRIBUTION—EAST. o ♀ Tay ♀ ♀ Sutherland o o

WEST. o Clyde ♀ West-Ross o

LAT. 56°-58°30′. RANGE IN EUROPE. Alps; and mountains of Britain, Norway, and Galicia; North Lapland. TYPE. Alpine and northern. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. August-June. FOOD-PLANT. *Saxifraga aizoides*, &c.

SALICATA Hb. Local. Alpine and sub-alpine. Ascends to 3000 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ ♀ ♀

WEST. ♀ Clyde Argyle West-Ross ♀

Lat. 55°40′-57°40′. RANGE IN EUROPE. Alps, Britain, Belgium, and Galicia. TYPE. Occidento-alpine. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June.. LARVA. August, September. FOOD-PLANT. Low plants.

The type (whose European range is given above) is the greenish-grey form not or scarcely marked with yellow. Two varieties of more southern distribution are recorded, which are paler, and either marked with yellow or ashy grey.

OLIVATA Bkh. Not uncommon. Nemoral. Ascends to about 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o

WEST. Solway Clyde ♀ West-Ross o

LAT. 54°40′-57°40′. RANGE IN EUROPE. Britain, Belgium, Alps, Germany, &c. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE.—IMAGO. July, August. LARVA. September-May. FOOD-PLANT. Low plants.

VIRIDARIA F. (1775); *pectinitaria* Knoch. (1731). Common. Ascends to 2100 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray Sutherland Orkney ♀
WEST. Solway Clyde Argyle West-Ross ♀

LAT. 54°40′-59°. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-August. LARVA. August, September. FOOD-PLANT. Low plants.

ASTHENA Hubn.

LUTEATA Schiff. Very local. Nemoral.

DISTRIBUTION—EAST. ♀ ♀ Tay o o o o o
WEST. Solway Clyde o o o

LAT. 54°40′-56°40′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June. LARVA. August, September. FOOD-PLANT. Alder.

CANDIDATA Schiff. Very local. Nemoral.

DISTRIBUTION—EAST. ♀ ♀ Tay o o o o o
WEST. Solway Clyde ♀ [West-Ross] o

Lat. 54°40′-56°40′. RANGE IN EUROPE. Central, &c. TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. July, August. FOOD-PLANT. Hazel.

EMMELESIA Steph.

AFFINITATA Stph. Not uncommon. Nemoral.

DISTRIBUTION—EAST. Tweed ♀ Tay Dee o o o o
WEST. Solway Clyde ♀ West-Ross o

Lat. 54°40′-57°30′. RANGE IN EUROPE. Britain, Holland, Germany, Lapland, &c. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August. FOOD-PLANT. *Lychnis*, &c. (seeds).

ALCHEMILLATA L. Not uncommon. Agrestal.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
West. Solway Clyde ♀ West-Ross o

Lat. 54°40′-57°40′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August, September. FOOD-PLANT. *Galeopsis tetrahit, Lychnis*, &c.

ALBULATA Schiff. Common. Pascual, nemoral. Ascends to 1100 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee ♀ o o o
WEST. Solway Clyde ♀ West-Ross o

Lat. 54°40′-57°30′. RANGE IN EUROPE. Central and northern. TYPE Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August. FOOD-PLANT. *Rhinanthus crista-galli* (seeds).

DECOLORATA Hb. Not common. Pascual.

DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. Solway Clyde o o o

LAT. 54°40′-56°30′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRIAIN. English.

TIME OF APPPARANCE—IMAGO. June, July. LARVA. August. FOOD-PLANT. *Lychnis*, &c. (seeds.)

TÆNIATA Stph. Rare.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o Clyde o o o

LAT. 56°-56°40′. RANGE IN EUROPE. Britain, Switzerland, Norway, Finland, &c. TYPE Centro-septentrional? TYPE IN BRITAIN. English?

TIME OF APPEARANCE—IMAGO. July. LARVA. ——? FOOD-PLANT. ——?

UNIFASCIATA Hw. Rare. Pascual.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway Clyde o o o

LAT. 54°40′-56°. RANGE IN EUROPE. Britain, France, Germany, Switzerland, &c. TYPE. Occidento-central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June-August. LARVA. August, September. FOOD-PLANT. *Silene*, &c. (seeds.)

MINORATA Tr. (1828); *ericetata* Stph. (1831). Not uncommon. Ericetal. Ascends to 1800 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray Sutherland ♀ ♀
WEST. ♀ Clyde ♀ West Ross ♀

Lat. 55°40′-58°40′. RANGE IN EUROPE. Britain, Germany, Alps, Lapland, &c. TYPE. Occidento-alpine. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. ——? FOOD-PLANT. ——?

ADÆQUATA Bkh. (1794); *blandiata* Hb. (1800?). Local. Pascual.

DISTRIBUTION—EAST. o o Tay ♀ Moray o o o
WEST. o Clyde Argyle West-Ross o

LAT 56°-57°40′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. June. LARVA. August. FOOD-PLANT. *Euphrasia* (seeds).

MELANTHIA Dup.

BICOLORATA Hufn. (1769); *rubiginata* F. (1787). Common. Nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde ♀ West-Ross ♀♀

LAT. 54°40′-57°40′ RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. June. FOOD-PLANT. Alder.

The ab. *plumbata* Curt. (more or less suffused with black) is not uncommon.

OCELLATA L. Common. Pascual and nemoral. Ascends to 1900 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ ♀ ♀
WEST. Solway Clyde Argyle West-Ross ♀♀

Lat. 54°40′-57°40′. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE.—IMAGO. June, July, August. LARVA. August-May. FOOD-PLANT. Low plants.

ALBICILLATA L. Rare. Nemoral.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

Lat. 54°50′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August, September. FOOD-PLANT. Bramble and raspberry.

COREMIA Gn.

MUNITATA Hb. Not uncommon. Pascual and nemoral. Ascends to 2600 feet or upwards.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀
Orkney ♀
WEST Solway Clyde Argyle West-Ross ♀

LAT. 54°40′-59°10′. RANGE IN EUROPE. Britain, Alps of central Europe; Iceland, Lapland, Finland, &c. TYPE. Northern and alpine. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. June-August. LARVA. August-June. FOOD-PLANT. Low plants.

DESIGNATA Rott. (1777); *propugnata* F. (1787). Local. Nemoral. Ascends to 1500 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀
Orkney o
WEST. Solway Clyde ♀ West-Ross ♀

Lat. 54°40′-59°10′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. August, September. FOOD-PLANT. Low plants.

FERRUGATA Cl. Local, nemoral, and ericetal. Ascends to 2700 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde ♀ ♀ o

Lat. 54°40′-57°40′. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May-June. LARVA. August, September. FOOD-PLANT. Low plants.

(*To be continued.*)

THE COLEOPTERA OF SCOTLAND.

(Continued from p. 84.)

EDITED BY D. SHARP, M.B.

ELONGATA Gyll. Not common.

DISTRIBUTION—EAST. ♀♀ Forth o o o o o o
WEST. Solway ♀♀ o o o

GIBBOSA Payk. Common.

DISTRIBUTION—EAST. ♀♀ Forth ♀♀ ♀♀ ♀♀ o o
WEST. Solway ♀♀ o o o

FUSCULA Gyll. Common.

DISTRIBUTION—EAST. Tweed Forth ♀♀ ♀♀ ♀♀ o o o
WEST. Solway ♀♀ o o o

MYCETOPHAGIDÆ.

MYCETOPHAGUS Redt.

QUADRIPUSTULATUS L. Very rare.

DISTRIBUTION—EAST. o o o o o o o o
WEST. o o o o o o

FULVICOLLIS Fab. Very rare.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o o

TYPHÆA Redt.

FUMATA L. Local.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway Clyde o o o

MYCETÆA Redt.

HIRTA Marsh. Scarce.

DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. Solway ♀♀ o o o

TRIPHYLLUS Redt.

SUTURALIS Fab. Very rare.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. o o o o o

DERMESTIDÆ.

DERMESTES Er.

FRISCHI Kug. Very rare.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

MURINUS L. Very scarce.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

LARDARIUS L. Rare.

DISTRIBUTION—EAST. Tweed Forth ♀ Dee o o o o
WEST. ♀ Clyde o o o

ATTAGENUS Er.

PELLIO Lin. Rare.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

ANTHRENUS Er.

VARIUS Fab. Very rare.

DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. o o o o o

[MUSÆORUM L. Doubtful as Scottish.

DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. o o o o o

"Jedburgh, Rev. W. Little," Murray Cat.

BYRRHIDÆ.

SYNCALYPTA Er.

SETIGERA Ill. Very rare. Maritime?

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

This species is found at Caerlaverock, near the mouth of the Nith.

BYRRHUS Er.

PILULA L. Common.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray Sutherland o o
WEST. Solway Clyde o o o

FASCIATUS Fab. Local. Maritime, and on the summits of lofty hills.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray Sutherland o o
WEST. ♀ ♀ ♀ o o

DORSALIS Fab. Rare.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o
WEST. ♀ ♀ o o o

CYTILUS Er.

VARIUS Fab. Common.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o
WEST. Solway Clyde o o o

MORYCHUS Er.

ÆNEUS Fab. Local, in sandy barren places on the coasts and banks of streams.

DISTRIBUTION—EAST. o Forth Tay Dee ♀ o o o
WEST. Solway Clyde Argyle o o

SIMPLOCARIA Er.

SEMISTRIATA Ill. Common.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o
WEST. Solway ♀ o o o

GEORYSSIDÆ.

GEORYSSUS Er.

PYGMÆUS Fab. Local. Riparial.

DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway. ♀ o o o

PARNIDÆ.

ELMIS Er.

ÆNEUS Müll. In streams. Common.

DISTRIBUTION—EAST. Tweed Forth ♀ ♀ Moray o o o
WEST. Solway ♀ o o o

VOLKMARI Panz. In streams. Not scarce.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ o o

PARALLELOPIPEDUS Müll. In streams. Not uncommon.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ o o

SUBVIOLACEUS Müll. In streams. Local.
DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway ♀ o o o

CUPREUS Müll. In streams. Local.
DISTRIBUTION.—EAST. ♀ Forth o o o o o o
West. Solway ♀ o o o

NITENS Müll. Very rare.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

Inserted on Mr. Hislop's authority, as found at Falkirk.

LIMNIUS Er.

TUBERCULATUS Müll. In streams. Common.
DISTRIBUTION—EAST. Tweed Forth ♀ ♀ ♀ o o o
WEST. Solway ♀ o o o

PARNUS Er.

PROLIFERICORNIS Fab. Common. In and near water.
DISTRIBUTION—EAST. Tweed Forth ♀ ♀ Moray o o o
WEST. Solway ♀ o o o

AURICULATUS Ill. Common.
DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway ♀ ♀ o o

NITIDULUS Heer. Very rare.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

A single individual found at Aberlady. D. S.

HETEROCERIDÆ.

HETEROCERUS Er.

FEMORALIS Kies. Maritime. Local.
DISTRIBUTION—EAST. o Forth ♀ ♀ ♀ o o o
WEST. Solway ♀ o o o

MARGINATUS Fab. Rare. In salt marshes.
DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. Solway ♀ o o o

SERICANS Kies. Very local. In salt marshes.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

This species is abundant in one spot near the mouth of the Nith.

(To be continued.)

ZOOLOGY.

ON MIGRATION.

By Colonel DRUMMOND HAY, C.M.Z.S.

(Continued from page 99.)

IN this country October would be considered by no means early for the departure of the swallow, whatever it may be in France. Mr. Gray says the Hirundines generally are obliged to leave our inhospitable climate as early as the beginning of September, and further states, that on the last day of August he was witness of a great assemblage of Swallows near Kelvin Bridge on the Partick Road, Glasgow, where their numbers were augmented from the whole surrounding country; at last, one morning they congregated on the house tops of the village of Partick, and after holding a council which lasted but an hour or two rose before mid-day in a body, and after a few anxious twitterings ascended cloudwards and left our country. This, he adds, is, as is well known, the manner of Swallows when leaving us for warmer climes; but this case, being so early in the season, leaves room to speculate on the reason so to speak for depriving us of their company. Mr. Gray mentions that the weather had been stormy. These birds probably prognosticating a further inclemency, this hastened their departure. It would seem to indicate that in both these instances the young and old took their departure at the same time; it is, however, the belief that they do not always do so, but are probably guided by circumstances.

An instance at one time occurred to myself when I had the advantage of witnessing one of these wonderful migrations actually on their passage. When coming home some years ago from the Mediterranean in a man-of-war, one of the fine old 90 gun-ships, and when in the vicinity of the Straits of Gibraltar, about twenty-five miles or so from land, on the evening of the 2nd of September, the weather being fine at the time with a light breeze, we were about sunset visited by a flight of many hundreds of Swallows, which after flying round

the ship for a time, uttering loud twitterings, finally settled in swarms all along the combings outside the ship, as also on the beadings both above and below the stern windows of the captain's cabin, the ward-room, and gun-room, as close as they could possibly pack. These all appeared to be old birds, though of this I could not be certain. One of the officers, however, of the ship, making a sweep with his cap outside one of the windows, captured more than a dozen of them, which on being liberated immediately joined their companions; these were all adults. In the morning not one was to be seen. Had these birds continued their journey the previous evening, another hour would have landed them in Africa, but, the Swallow being a day flyer, and as it was getting late, and such convenient quarters close at hand, they doubtless held a consultation in their twitterings, and prudently decided to stick by the ship.

Mr. Wallace, in his very able work, on the "Distribution of Animals," says, "almost all the migratory birds of Europe go southward to the Mediterranean, move along its coasts, *east* or *west*, and cross over in *three places only*; either from the south of Spain, in the neighbourhood of Gibraltar, from Sicily over Malta, and to the east by Greece and Cyprus. They are thus always in *sight of land*. The passage of most small birds (and many of the larger ones too) takes place at night, and they only cross the Mediterranean when the wind is steady from near the east or west, and when there is *moonlight:* and he further remarks, "that migrations of this type probably dated back from at least the period when there was a continuous land along the route passed over, and it is a suggestive fact that this land connection is known to have existed in recent geological times. Britain was connected with the continent during or probably before the glacial epoch; and Gibraltar, as well as Sicily and Malta, were also united with Africa. The submersion of these tracts of land (which were perhaps of considerable extent) would be a slow process. And from year to year the change might be hardly perceptable. It is easy to see (he adds) how the migration that had once taken place over continuous land would be kept up, first over lagoons and marshes, and then over a narrow channel and subsequently over a considerable sea, no one generation of birds ever perceiving any difference in the route."*

* Vol. I. page 20.

It is no doubt an accepted fact that our European migrants from the north to the south, and *vice versa*, cross the Mediterranean to the shores of Africa, but that they do so by moving east and west to *three points only*, and to those especially mentioned, and that they are thus always in *sight of land*, is so entirely opposed to the many years experience which I have had in the Mediterranean, and especially in the subject of migration, in which I have always taken the deepest interest, that without any wish to criticise I cannot avoid making a few observations.

That many of our own English birds go south, travelling by France and Spain, crossing at the nearest point in the neighbourhood of Gibraltar I think very likely; also that those about the same meridian as Sicily and Malta go in that direction; and those in the eastern parts travel by the Levant is natural enough, but that all the other birds of Europe between these meridians do so by travelling east and west is an alleged fact which I cannot accept. Were this the case there could be no regular birds of passage but merely accidental stragglers to the Balearic Islands, Corsica, Sardinia, and other places. So very many instances have come under my own notice, as well as from what has been recorded by others as to the crossing and recrossing of birds at various parts of the Mediterranean, that I feel pretty confident that European birds going north and south, keep a pretty straight course, with, may be, a very slight divergence either to east or west according to the line of coast which lies before them in a northerly or southerly direction. Thus the birds from Holland, Belgium, north of France, and probably some from our own land that have descended by the valley of the Rhone, would not hesitate to cross the Gulf of Lyons, some going by Minorca and Majorca, others crossing the Gulf of Valencia to Iviza, others still keeping the coast, would cross at Cape St. Martin, while the greater part of our own birds, which have passed from the Hampshire and Sussex coasts into Normandy, through France to the Pyrenees, or crossed the channel from the Lizard or the Land's End into Brittany over the Bay of Biscay (which I think there is sufficient evidence to show they occasionally do) into northern Spain or Portugal, together with the birds of all those countries would without difficulty effect the remainder of the passage, in no place much exceeding 120 miles, into Africa, anywhere between Cape Cartagena and the Straits of Gibraltar. Those that have come down by the line of the Alps would cross

with ease the Gulf of Genoa to Corsica and Sardinia, and so to the coast of Tunis. Those to the north and east of that descending by Italy and keeping a southerly course from the Roman States would strike the north part of Sicily; from thence they would cross over by Pantellaria to Cape Bon, a distance of about 80 miles to the former place (the shortest in the Mediterranean with the exception of Gibraltar) without going to Malta at all.

Those going by the Straits of Messina and eastern coast of Sicily to Malta, would still have to accomplish over two hundred miles of sea to get to the nearest part of the Tripoli coast in a southwardly direction, and even, if taking a due east or north-east course (which is not likely) to get to the nearest points they would have little short of two hundred miles to go; and some we know cross over from the Calabrian and Otranto coast in the south of Italy, and from the mouth of the Adriatic, a distance of about 500 miles or more. Those from Scandinavia, Austria, Western Russia, and Turkey, would naturally descend, some by the shores of the Adriatic, either due south to Benghazi on the Tripoli coast, or through the Ionian Islands and Morea to the most southern of the Ionian group, Cerigo, and so on by Crete to the African shores. To the eastward, by Macedonia, down the Archipelago; and still further to the east along the shores of the Black Sea, crossing the Bosphorus into Asia Minor, and even from the Crimea across the Black Sea and so continue their journey southward.

With the exception of from the coast of Southern Italy and mouth of the Adriatic, in no case would the distance exceed what we know our smallest birds do regularly in crossing the German Ocean. For instance, the little golden-crested wren performs a journey across sea of 400 miles, while the distances in the Mediterranean from any of the places mentioned, with the above exception, would not be half that. Can it be reasonable to suppose, following this rule of *eastern* and *western* movements (which of course must equally apply to the southern shores of the Mediterranean as well as the northern) that all birds from Algiers, and to the west of that would travel some hundreds of miles to get opposite Gibraltar on the one hand, and the same distance to the east to get opposite to Malta on the other hand, whereas, by keeping a direct course from Algiers to the nearest of the Balearic Islands, they would only have 150 miles to accomplish, and from the

north shores of Majorca to S. Sebastien not more than 120 miles, or even taking it from Minorca to the south of France, not much over 200 miles, or about one half the distance that most of our Fieldfares, Redwings, Snow-Buntings, Woodcocks, and Water-rails travel every autumn and spring.

The lines birds take, however, either one way or the other, are no doubt influenced to a certain extent by the direction of the wind, sudden change of wind, fogs, and thick weather. Birds as a rule prefer performing the journey with a side wind, or on the quarter, a head wind, if not too strong, or even a calm, but not direct aft (to use a sailor's term) which would compel them to shift their course. A sudden change of wind, especially with thick weather, in many cases has the effect of bewildering the birds, and causing them to fly for refuge to the nearest land, many of them perhaps perishing in the attempt.

In reference to the influence of winds, the late Captain Sperling, who paid much attention to the migration of birds in the Mediterranean, he having been a good deal at sea, and thereby had many opportunities of watching the birds during their passage, says that in spring, when going north, the greater numbers cross when the wind is either westerly or northwesterly; while in autumn, when going to the south, they appeared to prefer it in an easterly or southeasterly direction, and that he was led to infer from this, that they did not like a fair wind to travel with, but prefer it on one side or the other, and that he had noticed that the preference was generally given to its being on their left side. Not but what he had seen exceptions to this, especially in the larger birds, which generally fly by day, * and cross without any regard to wind. In speaking of the quail passing to the *northward*, he says that should there have been a light wind from the west during the night, the island of Malta would probably be covered with them in the morning; but if the wind was from the eastward, it would be very little use looking for them. But when they are going to the *southward* in autumn the right time to look for them is after the wind has been blowing from the eastward, and this is corroborated by Mr Wright, † who says that in spring the quail come during the night, and chiefly to the west and north-west coasts of Malta; in the autumn, on the contrary, they arrive for the most part during the hours of daylight, and then the east coasts are the

* Ibis. 1864, p. 270. † Ibis.

parts where they are most abundant. This accords with my own experience. The bewilderment of birds, owing to a sudden change of wind is also very forcibly described by Captain Sperling, who narrates his having seen a flock of Turtle-doves at sea so utterly confounded by a sudden shift of wind that they settled on the ship and continued making endless excursions of about a mile in various directions, but only to return again to make a fresh start. With regard to foggy weather Mr. Cordeaux, ("Birds of the Humber District") says that it is not so much wild stormy weather and high winds that are fatal to our little migratory birds in their long dreary passage (from the Naze in Scandinavia to Flamborough Head or the Spurn), but thick and especially drizzly and foggy weather.

To the effect that birds do not confine themselves to the lines laid down by Mr. Wallace, but have a more extended range, I could mention numerous instances, but a few will suffice. Mr. Thomson of Belfast mentions, that when in H.M.S. Beacon with his friend Captain Graves, on a voyage from Malta to Greece, between the 21st and the 27th of April, 1841, they fell in with numerous birds, Black-headed Buntings, Willow-Wrens, Chiffchaffs, Redstarts, Wagtails, Wheatears, Whitethroats, (both kinds) Golden-Orioles, Hoopoes, Nightjars, Quail, Wryneck, and Woodchat. I may state that two years after this I had also the pleasure of sailing with the late Captain Graves (who was a very intimate friend of mine) in H.M.S. Beacon, leaving Malta about a week earlier than the date above mentioned, going direct to Cerigo on our passage to Crete, and between the latter place and Malta we met with very much the same birds: in addition, however, were several Rollers, and three Landrail, which passed close to the ship along with several Quail.

I mention these two voyages of the Beacon the more especially, as that part of the sea, from the south coast of Italy and the mouth of the Adriatic, to the shores of Tripoli, is free of all rocks or islands, and has about the widest stretch of water, namely about 500 miles, and yet along the whole track, or nearly so, from Malta to Cape Matapan on the Greek coast, we were visited every day by birds of passage, and as the old Beacon was not noted for her sailing qualities as to speed, we had many opportunites of observing them. I have only mentioned the shorter-winged birds, but quantities of Swallows, Bee-eaters, and Red-legged Falcons also visited the ship, many of the latter remaining with us for some time perched about the rig-

ging. Captain Sperling also gives a few instances of having on the same track noticed the following, the passage being nearly over at the time: Turtle-dove on the 25th of May, nearest land being 135 miles, and at the same date Sand-martins 110 miles. Again, on the southern migration, in their flights across the same sea, in the month of October (also a little late) he observed the following: Thrush 105 miles from the nearest land, two Robins (already alluded to) at the same distance from land, Short-eared Owl 100 miles, all from the nearest of the Ionian Islands; Turtle-doves (number not recorded) 240 miles from Malta, nearest land; these distances, on glancing at the map, clearly show that the birds were going direct to and from the Calabrian coast, the mouth of the Adriatic, and the coasts of Tripoli.

There are also many instances recorded of birds crossing other parts of the Mediterranean off Sicily, Sardinia, &c., both by the late Captain Sperling and other authorities, and I have myself witnessed birds early in March passing from the African to the Spanish coast in the track between Algiers and Gibraltar, and on the 9th of that month, at about nine o'clock in the morning, rather a rare bird, and interesting in the southern part of Europe, namely the Red-throated Blue-breast, (*Cyanecula Suecica* Brehm.) flew on board direct from the south, when about 25 miles from Cape de Gata, the nearest land, and about 100 miles from the opposite coast; this specimen is now in my collection. I say interesting, as there seems to be some doubt, according to Gould and other authorities, as to where this bird winters.

Among other birds that I particularly observed during the passage is the Quail, both on their arrival and immediately previous to their departure. On the Island of Fano, at the mouth of the Adriatic, and about 30 miles to the north and west of Corfu, it was my good fortune to see a large flight of Quail make the land. The day previous the island was covered with them, but on the morning of the day I speak of, the 12th of April, 1842, there was not a bird to be seen, they all having left during the night. While sauntering along the rocky slopes of the island, which stretched down to the sea many feet below me, I was suddenly stopped by a precipice which went sheer down; on looking over I saw coming direct from seaward six or seven little birds, which I took to be Starlings, and which settled close to the water's

edge on the rocks below; this was about 11 o'clock A.M. A minute or two afterwards I saw seven or eight more light a little further up, after which small trips, from three to eight or fourteen birds, kept coming in quite fast, and alighting in every direction. I marked some down close to me, and on going to the spot up got a Quail, then another, then another, in the very spot where five minutes before there was not one to be seen; the passage lasted about two hours and a-half, and by two o'clock the whole of that part of the island to the westward was swarming with Quail; the wind was light and from the westward, the weather dull, but not thick.

From the direction these birds seemed to come, there is no doubt in my mind that they had left the coast of Tripoli somewhere about the Headland of Benghazi. Computing the distance at 500 miles, and the rate of flight at 30 miles an hour, (one-third of that of the swallow,) they would have occupied between 16 and 17 hours in the passage, and consequently must have left the African coast between six and seven in the evening, namely at sunset, which is just about the time they would naturally have done. Though many birds fly by night, still it depends very much on the distance they have to go, and the rate of flight (according to circumstances), whether they may be able to make the land before day-light or not. The Quail, however, on its northern passage to Malta, having only little more than 200 miles to travel, would be enabled, at the same rate, and leaving Africa at the same hour, to reach the land about two o'clock in the morning, which is the time we know they generally do. During a visit of some weeks to the Tunisian territory, and while in the vicinity of Carthage, early in April, I had numerous opportunities of observing the flights of Quail, which I have every reason to believe, in the same way as at Fano, reached the coast from the interior, moving in a body of thousands of small trips, bevies, or families, probably the last year's broods, if not that of the season, as there is nothing to show that the Quail may not have two broods in the year, and if they have eggs early in March in Malta, as I have found to be the case, why should they not be a little earlier in the interior of Africa? And supposing they were hatched three weeks sooner than in Malta, say by the middle of February, there would be plenty of time for the young birds to be sufficiently strong to migrate in the middle of April.

Against this, however, the late Mr. Yarrel has recorded, "That the males are said to arrive before the females, and that advantage is taken of this circumstance by bird-catchers in France, who every year decoy hundreds of dozens of males only into their nets by imitating the call note of the *female*. These birds are brought by French dealers in Quails to the London markets in large quantities, and on examination of dozens together in the flat cages in which they are carried, it is rare to find a female among them." It not having come sufficiently under my notice to decide whether these great flights which annually visit Europe are entirely composed of males, females, or young respectively, or whether the bevies composing the later flights consist of both females and young in broods, it is a question which I must leave to those who may have the opportunity of solving, but may it not be that the cause of these birds all being males, is that the call of the female only is used, and consequently supposing there were hundreds of females in the same vicinity, it would only be the male bird that by this method would be captured.

I invariably noticed that the Quails came in the night, and instead of spreading out along the coast, previous to taking their departure, they were always to be met in lines, or columns, running north and south, that is perpendicular to the coast, as if these bevies followed each other and dropped in succession; the lines were from 50 to 100 or 200 yards in width, and extended a couple of miles or more from the coast inland, and were not less than a mile or two miles apart. My belief is, that they rested the whole day, and the weather favouring them, departed for Europe the following night, fresh bevies coming in to supply their place. These lines being generally in a different spot every day led me to the belief that they were fresh birds. Sardinia being immediately opposite, and only about 150 miles from the shores of Carthage, they would easily make the passage in five or six hours, arriving there about midnight. Should the supposition of the Quail breeding twice a year be a correct one, it would account for the countless thousands which annually invade the whole extent of Southern Europe in spring, with a corresponding reflux in autumn, notwithstanding the enormous quantities which are destroyed and captured, and sent to every market in Europe, and yet the following year reappear in undiminished numbers.

So numerous are the Quail in these migrations that, as Mr.

Gould remarks, "If a correct statistical account could be obtained of the numbers shot in the British Islands, and of the numbers brought to our markets alive, from Egypt, Italy, and other southern and eastern countries, I imagine we should be truly astonished; and Latham has recorded that twice a year the Island of Capri was visited with Quails in such numbers that the Bishop of the island drew the chief part of his revenue from them, and on the west coast of Naples, within the space of four or five miles, 100,000 had been taken in a day."

While on the subject of these wonderful migrations of Quail I can scarcely bring it to a close without alluding to the miraculous provision of these birds as food in the wilderness. We read in Ps. lxxviii. 27. (E.V.) "He caused the east wind to blow under heaven; and through His power He brought in the south-west wind." How marvellously does this coincide with what we see in nature; the Quail came up with an east wind, and at the right moment, a sudden shift takes place, causing them to fall down exhausted in the heart of the camp of the Israelites. And in Ps. cv. 40, "The people asked, and He brought Quails." and again in Ex. xvi. 11-13, "It came to pass that at even the Quails came up and covered the camp." With this before us, is it not strange that some dispute whether the bird with which the Israelites were visited were Quail at all, and others going still further have asserted that they were not even birds, and this in the face of what we are told, Ps. lxxviii. 27, "He rained flesh also upon them as dust, and feathered fowls like as the sand of the sea."

Dr. Tristram, a clergyman not only thoroughly acquainted with the Arabic and Hebrew roots, but one who has explored every inch of Palestine, and at the same time a good ornithologist and close observer of nature, may well be considered competent to give as good and sound an opinion as most men, and he says in his interesting little work "The Natural History of the Bible," that ingenious commentators have spared no pains in the attempt to prove the Hebrew word "Selav" was not a quail, but some other creature they imagined more likely to be found in the desert. In spite of all etymology, and of the distinct allusion in the Psalms of *feathered* fowl, some have suggested Locusts, some Flying Fish; others again have conjectured Sand-Grouse, "Kata," or the desert Sheil-Drake, (*Casarca rutila*), found about the Salt Lakes, a most uneatable bird; while Dean Stanley has put forward the idea of large red-legged Cranes three feet high,

with black and white wings measuring seven feet from tip to tip; by which he undoubtedly means the White Stork, the innumerable flights of which literally darkened the sky, he states, when camping near the Wady Huderah (Sinai and Palestine, p. 82). And Dr. Tristram goes on to to say what is undoubtedly true that vast flocks of all these three species of birds do visit the Sinaitic desert at the time of migration; and I have also seen the Black Stork in almost as large numbers in the desert; while the Dean suggests the possibility of the Stork, on account of its standing three feet high, and thus explaining the statement of their being two cubits from the ground.* But besides the fact that the flesh of these birds is abominable for food, while the Sand-Grouse is very dry and hard, and could scarcely have satisfied the hungry people, we have the clear proof of the identity of the Common Quail with the Hebrew "Selav" in its Arabic name "Salwa" from a root signifying "to be fat"—very descriptive of the round, plump form and fat flesh of the Quail. The expression "as it were two cubits high upon the face of the earth" probably refers to the height at which the Quails fly above the ground. At all times its flight is very low, just skimming the surface of the ground, and especially when fatigued it keeps close, never towering like the Partridge or Sand-Grouse. And again we read that the wind brought them up from the sea, and that keeping close to the ground they fell thick as rain about the camp—(in the month of April according to our calculations). Thus the miracle consisted in the supply being brought to the tents of Israel by special guidance, in exact harmony with the known habits of the bird. All birds, especially the short winged ones, are more or less fat during the periods of their migrations; a wise provision of nature to support these frail creatures, who without sleep, and often without food, are enabled to endure the greatest fatigues; the fat nourishing the body and becoming gradually absorbed in the system, so that by the time the journey is completed they have been found to be in the poorest condition. This I have particularly noticed in the Woodcock on their first arrival to their winter quarters in Albania and other southern parts of Europe. As to the Quail I have often seen them so fat on their passage that when shot they have burst asunder on falling to the ground, which quite corroborates Canon Tristram's remarks.

* Numbers xi. 31.

With regard to the hereditary custom alluded to by Mr. Wallace, as to birds passing over the same track, from generation to generation, without ever having perceived that whereas their fathers passed over dry land they in the same spot have now to cross a dangerous sea, this theory seems to me to fall to the ground in the very fact, as has been shown, that the young do not migrate with their parents, and therefore never could have had the route handed down to them. Captain Sperling believed that *all birds* cross the *whole breadth* of the Mediterranean in one night (unless there happens to be an island in their track) and I am very much of the same opinion. As to the passage being effected always by moonlight (according to Mr. Wallace), though they may occasionally do so, there is evidence to show that they pass in the very darkest of nights, and even when there is not a star to be seen.

(To be continued.)

THE LEPIDOPTERA OF MONCREIFFE HILL

By Sir THOMAS MONCREIFFE, Bart.

(Continued from page 110.)

Trachea piniperda is about the earliest of our noctuæ in this locality. I took one on a Scots fir trunk on the 22nd of February, 1872. It is however most unpunctual in its habits, as if it appears in February one season it may not show till April the next, and in 1874 we never saw it at all, though we were nightly at the sallows where it is usually found. It was however plentiful in 1875. It does not appear to be more influenced by weather than others of the spring insects, and it cannot suffer from the lack of its food plant, as that is always there one season the same as another; why then an occasional total absence? It is commonly distributed over the higher levels, and comes down to my garden occasionally, to feed at the early sallows.

Tæniocampa gothica.—Abundant at sallow blossom, at all elevations. Very variable in shade and intensity of colour, as also in the pattern on the wings. I took several of the var.

gothicina in 1873, but it does not appear every season. Some of the varieties here are very dark.

T. rubricosa.—Common at sallow, particularly at the later blooming ones. I take it more commonly towards 600 feet than lower down. Comes to light occasionally in my study.

T. incerta (instabilis).—Abundant, and excessively variable. Some specimens almost black. To be found wherever the sallows blossom, in equal abundance at all elevations.

T. populeti.—Rare. I took one specimen at sallow in April, 1872, at an elevation of 600 feet. This is the only specimen I know of having been taken at Moncreiffe.

T. stabilis.—Abundant at sallow. I have taken this insect at sugar some seasons before the sallows were out. This season however it was far behind the sallows, at least it was invisible until March 30th, 24 days after I observed the first sallow blossom on the 7th of March. This was exactly 21 days later than in 1872, when I shook a specimen off a sallow which did not shew a yellow blossom, and 29 days later than two specimens I took on a sugared birch on February 23rd, 1874. One of the prettiest sights I ever saw was on this occasion. It was a fine warm night, and the birch was a large weeping one, on the trunk of which I had placed a small patch of sugar; *S. satellitia* and *C. vaccinii* literally swarmed upon it, and as they satisfied their appetites they either crawled up the stem and along the branches, or flew on to the pendant tresses of the birch which hang gracefully to the ground, and there looked like fruit hanging on a leafless tree. I counted 122 hanging in this way on the pendant twigs, and the two *stabilis* among them. As I remarked above, I saw a yellow blossom on a sallow in my garden this year on the 7th of March, and the tree appeared to be in full bloom on the 23rd. Upon a closer examination I found, however, that the southern faces of the catkins only were acted upon by the heat of the sun, whilst on the side facing the north they were still dark and scarcely downy. The sun for a fortnight was bright and hot through the day, whilst the thermometer ranged from 16 to 20 Fahrenheit at night. The day-flying insects had certainly the best of it, as the hive bees worked hard for a couple of hours through the day, although, by the way, I did not see a wild bee till the first week of April.

T. cruda.—Abundant at sallow blossom, varies slightly in size

and in shade of colour, and is generally distributed. It is curious how variable the *Tæniocampæ* are in their behaviour as regards light. I think it depends partly on the brightness or darkness of the night, and partly on the time of night that you visit the sallows. I have generally observed that if you shake them early the moths rise very soon from the sheet, and on rising return immediately to their unfinished supper, whereas if you give them time to have a good feed they remain longer quiet on the sheet, and on rising fly at the light. The last few nights I have gone out (April 5, 6, 7, 8, 1877,) the nights have been dark, and we have started about 9.15. p.m., and the *Tæniocampæ* (*stabilis*, *instabilis*, *gothica*, and *cruda*) have behaved as if we had covered ourselves with some very attractive bait, swarming all over us, as we knelt on the ground, covering our lamps, clothing, face, hands, and hair, like hiving bees. The difficulty is to get away from them, the only way being to "douse the glim" and bolt through the bushes. *Stabilis* and *cruda* are the most persistent, *gothica* and *instabilis* making a few bold rushes and then off.

Orthosia upsilon.—Rare. I have one specimen taken at sugar in my garden in July, 1871. I have not seen it since. The larva has been found not far beyond the western boundary of the district.

O. lota.—Rare. The specimens I have were taken at sugar.

O. macilenta.—Not uncommon at sugar, some seasons even plentiful when it does occur. In 1872 I did not see a single specimen.

Anchocelis rufina.—Mr. Herd tells me this insect is common some seasons; but as I am often absent at the time of year that it occurs, I have never seen it in plenty, indeed quite the contrary.

A. lunosa.—Rare. At least we have never taken many specimens, possibly we have not found out how to look for them.

Orrhodia vaccinii.—Abundant in most seasons, although in 1872 it was scarcely to be seen here. We have several varieties, seemingly the three that are mentioned by Dr. Staudinger in his catalogue. I have no doubt that this and others of the hybernating insects find food of some sort in the resinous exudations from the foliage of evergreen trees, such as spruce, Scots fir, and the cupressi. I have noticed several of the lepidoptera in the bright calm frosty moonlight nights after the new year, *vaccinii* among the number, flying about and settling

on these plants. I once saw an unfortunate *vaccinii*, which had been feeding on plum blossom on the garden wall, in the grip of a centipede, which had got him fast with his forceps, and was holding on behind to the wall.

Scopelosoma satellitia.—Swarms at sugar in the autumn, and is still plentiful late on in spring at the sallows. This moth varies in the two usual forms to some extent,—the red-brown ground colour, with the usual white or yellow spot,—or an olive ground with the white or yellow spot,—one specimen I have is almost black with a bright white spot.

Xanthia fulvago (cerago).—Common in certain localities in some seasons, in 1876 particularly so on the ragwort blossom. Comes also to sugar. The variety *flavescens* occurs.

X. togata (silago).—Common and more generally distributed than the last species. It was, I may say, abundant on ragwort blossom in the autumn of 1876, and particularly richly coloured.

X. circellaris (ferruginea).—Common and generally distributed. I have reared this insect from the seeds of the Scotch (wych) elm, but have not observed *gilvago.*

Cirrhœdia centrago (xerampelina).—Common some seasons on the trunks of ash trees, usually from 100 to 200 feet. I remember Mr. Herd taking a specimen on heather blossom at an elevation of 600 feet. None were observed in 1872.

Tethea retusa.—Mr. Herd took one specimen on a poplar trunk in 1875. We have not noticed the larva.

Euperia palcacea (fulvago).—I have a specimen which was taken by Mr. Herd, but I have heard of no other.

Cosmia trapezina.—Abundant most seasons, particularly on ragwort blossom, and I think we have every possible variety.

Dianthœcia capsincola.—A common insect flying in great numbers at the flowers of *Lychnis vespertina*, in the evening. I thought at one time that *cucubali* also occurred here, but I find I am mistaken.

D. carpophaga.—Rare. I took it this year for the first time here.

Polia chi.—Abundant. I have been told that the variety *olivacea* occurs but I have never seen it.

Dasypolia templi.—I have never captured this species, but Mr. Herd has been fortunate in obtaining several specimens. On one occasion a cartload of unslaked lime was laid down at the back of my stables, Mr. Herd was turning the lumps over,

and a male *templi* crawled out; when the lime was being made, and after a pail or two of water had been sluiced upon it, out struggled the female. It is curious where some moths conceal themselves, but this must have been a most uncomfortable habitation.

Miselia oxyacanthæ.—Common along the hedgerows at the base of the hill, and comes freely to sugar. I have not observed the slightest variation in this insect, and for once the dark variety appears to come from the south; at least although the melanic varieties of many of the lepidoptera are frequent here, I have seen no approach to melanism in *oxyacanthæ*.

Euplexia lucipara.—It is curious that this insect, which is now locally common, was not noticed here till 1872, and its numbers appear to increase annually. It may be netted on the wing in the evening rambling about the back of a thorn hedge along the bracken and ground ivy blossom; may be taken feeding at the campion flowers, or at sugar, and comes also freely to light in my study.

Aplecta herbida.—Not uncommon. Varies in depth of shade of the green. Ascends to 600 feet. Comes to sugar. Mr. Herd reared a specimen from a larva we found feeding on sallow blossom at night.

A. tincta.—Mr. Herd tells me he has taken this moth, but I have not met with it.

Hadena adusta.—Locally common at sugar some seasons. I first met with it in 1874 at sugar in the same locality I had sugared the two previous seasons without seeing it. Mr. Herd had, however, I believe, met with it formerly.

H. protea.—This is another moth which was abundant at sugar and at Phlox blossom in my garden in 1870. I only observed one specimen in 1872, and none in 1873, since which time I have met with it each season, but in no abundance. Ascends to 600 feet, and is common at that elevation. Some specimens are very dark.

H. glauca I first noticed in 1874, and as I have found it pretty commonly in the same locality, viz., on an old wall, each season since, it had probably been previously overlooked.

H. dentina.—Common some seasons, especially in the same locality as *glauca*. Comes freely to sugar, and shews considerable variety in intensity of shade and in the size and clearness of the white tooth-mark.

H. thalassina.—Common at all elevations up to 600 feet. I

think those obtained at the higher elevation are more brightly coloured than those taken lower down. This insect comes commonly to sugar, but I usually take the males hunting about quite a week before they come to food. It strikes me that many insects do not feed freely until they have mated. Comes to light.

H. rectilinea.—I do not think this insect was observed here till 1873. It is now pretty frequent at sugar some seasons.

Chloantha solidaginis.—Rare. The only specimen of this insect which I have seen at rest in the day time, looked very peculiar, as it had buried its head between the interstices of the bark of a rugged birch and was holding on by its fore legs, the body and rolled up wings sticking out perpendicularly from the trunk. I took it at first to be the stump of a broken branchlet, but on touching it found it was soft, and boxed it accordingly. I took another specimen down near my house on a ragwort blossom close to a large bed of *Hypericum.* I was in hopes I had got *perspicillaris*, but was disappointed. It is curious that the nearest *Vaccinium* is three quarters of a mile away on the other face of the hill, with a difference of elevation of nearly 500 feet.

C. exoleta.—Abundant, and may be met with at times during nine months in the year, and indeed it is hard to say whether it might not be met with in every month except July. Comes freely to sugar and blossom, and occasionally to light.

Cucullia chamomillæ.—Frequent at campion blossom some seasons. This is an earlier insect here than *umbratica*, and is usually becoming worn when the latter appears. When the white campion comes early into blossom, I have no difficulty in obtaining a few specimens of *chamomillæ.*

C. umbratica.—Common, or I should say "abundant" some seasons, although I scarcely saw one in 1872. It is particularly partial to campion, rhododendron and turncap lily, and is at times quite a pest. It does not appear to be shy of the lantern, as I have turned the light full upon it whilst hovering at the blossoms without disturbing it in the least. It usually appears towards the end of June.

Anarta myrtilli.—Not common. Occurs sparingly among the heather and *Vaccinium*, about 600 feet up.

Abrostola urticæ.—Abundant, at all sorts of blossom. I think some of our specimens are darker than those from the south.

Plusia chrysitis.—Locally abundant; particularly partial to

the blossoms of white campion at dusk. It flies also and basks on the fruit walls in the sunshine occasionally. Both this insect and *gamma* bask in the same way, and fly through the day, and in this habit appear to be a link between the day-flying and night-loving species. They both appear to feed towards dusk, and are nearly the earliest noctuæ that come to blossom. The extent of the central shade is the only variation I observe,—an almost equal number having it entire or interrupted in the middle.

G. bractea.—Common some seasons, but local and difficult to obtain in first-rate condition. Much more common than the following species, and flies rather later than some of its congeners. I have taken it by the light of the lantern flying at campion blossom long after it was too dark to distinguish any insect without a light.

P. festucæ.—Not common. Partial to rhododendron, red valerian and white campion blossom, not forgetting the brown turncap lily, a great favourite with all the Lepidoptera that feed on the wing or partially so.

P. gamma.—Abundant from June. Hibernates I think, as I see it occasionally basking on the rocks in early spring.

P. interrogationis.—I have a specimen, unfortunately a good deal spoilt, taken in the garden by one of my sons. Mr. Herd has taken specimens on the higher ground.

Stilbia anomala.—Locally common at the blossom of ragwort and wood sage; comes also to light or at least may be taken on the wing with a lantern.

Euclidia mi.—Mr. Herd used to take this insect on the lower ground at the base of Moncreiffe Hill; it has not been noticed however of late years.

This completes the list of Noctuæ which have been observed at Moncreiffe as far as I know, but I have no doubt a few more may occur, as several of the more local species have only been observed within the last three or four years.

59. Thyatira batis; *c*
60. Cymatophora duplaris; *f*
61 „ flavicornis; *f*
62. Bryophila perla; *c*
63. Acronycta psi; *c*
64. „ ligustri; *c*
65. „ rumicis; *c*
66. Leucania conigera; *c*
67. „ lithargyria; *c*
68. „ comma; *c*
69. „ impura; *c*
70. „ pallens; *c*
71. Nonagria fulva; *c*
72. Gortyna flavago; *c*

73. Hydræcia nictitans ; *c*
74. „ petasitis ; *r*
75. „ micacea ; *c*
76. Axylia putris ; *r*
77. Xylophasia rurea ; *c*
78. „ lithoxylea ; *c*
79. „ polyodon ; *c*
80. Heliophobus popularis ; *f*
81. Charæas graminis ; *c*
82. Luperina testacea ; c
83. „ cespitis ; *c*
84. Mamestra anceps ; *v r*
85. „ furva ; *v r*
86. „ brassicæ ; *c*
87. Apamea basilinea ; *c*
88. „ gemina ; *c*
89. „ unanimis ; *r*
90. „ oculea ; *c*
91. Miana strigilis ; *f*
92. „ fasciuncula ; *c*
93. „ literosa ; *f*
94. „ arcuosa ; *c*
95. Caradrina blanda ; *c*
96. „ cubicularis ; *c*
97. Rusina tenebrosa ; *c*
98. Agrotis suffusa ; *r*
99. „ segetum ; *c*
100. „ exclamationis ; *c*
101. „ corticea ; *f*
102. „ nigricans ; *c*
103. „ obelisca ; *c*
104. „ porphyrea ; *c*
105. „ lucernea ; *r*
106. Triphæna ianthina ; *c*
107. „ fimbria ; *f*
108. „ orbona ; *c*
109. „ pronuba ; *c*
110. Noctua glareosa ; *c*
111. „ depuncta ; *c*
112. „ plecta ; *c*
113. „ c-nigrum ; *f*
114. „ ditrapezium ; *c*
115. Noctua triangulum ; *r*
116. „ rhomboidea ; *c*
117. „ brunnea ; *c*
118. „ festiva ; *c*
119. „ dahlii ; *c*
120. „ rubi ; *f*
121. „ umbrosa ; *c*
122. „ baia ; *c*
123. „ neglecta ; *r*
124. „ xanthographa ; *c*
125. Trachea piniperda ; *c*
126. Tæniocampa gothica ; *c*
127. „ rubricosa ; *c*
128. „ instabilis ; *c*
129. „ populeti ; *v r*
130. „ stabilis ; *c*
131. „ cruda ; *c*
132. Orthosia upsilon ; *v r*
133. „ lota ; *r*
134. „ macilenta ; *c*
135. Anchocelis lunosa ; *r*
136. „ rufina ; *c*
137. „ litura ; *c*
138. Orrhodia vaccinii ; *c*
139. Scopelesoma satellitia ; *c*
140. Xanthia cerago ; *c*
141. „ silago ; *c*
142. „ ferruginea ; *c*
143. Cirrhœdia xerampelina ; *c*
144. Tethea retusa ; *v r*
145. Euperia fulvago ; *v r*
146. Cosmia trapezina ; *c*
147. Dianthœcia capsincola ; *c*
148. „ carpophaga ; *v r*
149. „ conspersa ; *r*
150. Hecatera serena ; *r*
151. Polia chi ; *c*
152. Dasypolia templi ; *r*
153. Epunda nigra ; *r*
154. Miselia oxyacanthæ ; *c*
155. Agriopis aprilina ; *c*
156. Phlogophora meticulosa ; *f*

157. Euplexia lucipara ; *c*
158. Aplecta herbida ; *f*
156. „ nebulosa ; *c*
160. „ tincta ; *v r*
161. Hadena adusta ; *c*
162. „ protea ; *c*
163. „ glauca ; *c*
164. „ dentina ; *c*
165. „ oleracea ; *c*
166. „ thalassina ; *c*
167. „ rectilinea ; *c*
168. Chloantha solidaginis ; *r*
169. Calocampa vetusta ; *f*
170. „ exoleta ; *c*
171. Cucullia chamomillæ ; *f*
172. Cucullia umbratica ; *c*
173. Anarta myrtilli ; *r*
174. Abrostola urticæ ; *c*
175. Plusia chrysitis ; *c*
176. „ bractea ; *f*
177. „ festucæ ; *r*
178. „ iota ; *c*
179. „ v-aureum ; *c*
180. „ gamma ; *c*
181. „ interrogationis ; *r*
182. Gonoptera libatrix ; *r*
183. Mania maura , *c*
184. Stilbia anomala ; *f*
185. Euclidia mi ; *r*

(*To be continued.*)

DOES ALTERNATION OF GENERATIONS OR DIMORPHISM OCCUR IN EUROPEAN CYNIPIDAE?

By P. CAMERON.

IN the present paper I purpose discussing the question raised by Dr. Adler as to the occurence of alternation of generations in certain European Cynipidæ, and at the same time making some remarks on parthenogenesis in the Cynipidæ and Tenthredinidae.

We owe to the labours of Hartig the first proper generic arrangement of the Cynipidæ. This author not only distributed the gall-making species into several well defined genera, but, what was equally important, he clearly separated those which were true gall-makers from those forms which lived as inquilines in galls raised by other species, and from others which were pure and simple animal parasites like the ichneumons. By this work he removed many difficulties from the path of the student, and rendered the further study of the group clear and intelligible.

Hartig divided the gall-making Cynipidæ into eleven genera—*Cynips*, *Biorhiza*, *Andricus*, *Teras*, *Synophrus* *Trigonaspis*, *Spathogaster*, *Neuroterus*, *Diastophrus*, *Rhodites* and

Aulax, the first eight being exclusively confined to the oak, and the last three to other plants. He furthermore pointed out that among certain genera there were absolutely no males, while with others the two sexes were in nearly equal proportions; *Cynips*, (or *Cynips*, *Dryophanta*, and *Aphilothrix*, as now restricted by Foerster) *Synophrus*, *Biorhiza*, *Neuroterus* (except some parasitic species of doubtful generic location) being in the former predicament.

To a very great degree the evidence proving the unisexual condition of these insects is to a more or less extent of a negative nature, and consists mainly in many thousands of them having been reared from their respective galls, by competent naturalists all over Europe, without a single male having been discovered. But the evidence is not entirely of this negative character. Mr. F. Smith took some galls of *Cynips Kollari* to a locality where they were previously unknown, and that species was soon located there. I have repeated myself this experiment with single galls of *Kollari*, and also with *Aphilothrix radicis*, with entire success. So that, granting that no dimorphism occurs, we are quite justified in concluding that no males exist, or if they do they must appear at long intervals and in very limited numbers.

It is to be noted also that the bisexual species are as a whole vernal, the galls appearing with the young leaves and flowers, and the insects pass with great rapidity through their transformations, some of them reaching the perfect state in 3 weeks after the appearance of the galls. The agamic species again are mostly autumnal, and their galls are much harder, larger, and of a more complicated structure than the others.

Briefly stated, Dr. Adler's hypothesis is that the bisexual spring-forms oviposit on their exclusion in early summer, and give origin in the autumn, not to galls and insects like themselves, but to totally different galls, which yield agamic forms very dissimilar to the spring ones, and these autumnal insects hibernate, and lay their eggs in early spring, which in due time yield the bisexual flies. Thus, he states that *Spathogaster baccarum*, the maker of the common "Currant galls," oviposits in the young leaves, producing the well known "spangle galls" of *Neuroterus lenticularis*, which in the spring lays its eggs in the buds, giving issue to the "Currant galls." In the same way Alder connects

Neuroterus fumipennis with *Spathogaster albipes*
„ *numismatis* „ „ *vesicatrix*

Drvophanta scutellaris with *Trigonaspis megaptera*
„ *longiventris* „ *Spath. Taschenbergi*
Aphilothrix radicis „ *Andricus noduli*

Let us see if a consideration of the biology of the species named affords us any reasonable evidence in favour of this rather startling hypothesis. It must be evident for one thing, that if the species are corelated in the way indicated, we ought to find the two forms equally abundant and in close proximity to each other, just as we find the dimorphic forms of *Primula* together; and this must be more especially the case considering the extremely sluggish nature of the Cynipidæ. Some of the species no doubt are found in the same vicinity, but with others this certainly does not happen. *Trig. megaptera* is not uncommon in many woods around Glasgow; it is very common for instance at Kenmuir Bank, where *D. scutellaris* does not occur at all, nor even within some miles of it; and it has such a conspicuous gall that it could scarcely be overlooked. Schenck* also states that *T. megaptera* is very rare, and *D. scutellaris* abundant in Nassau, and this I think will be the case generally. *S. vesicatrix*, again, is a very local species, by no means common, while *N. numismatis* is met with every where. *N. fumipennis* is not uncommon, while *S. albipes* has only been recorded in Britain from the vicinity of Glasgow. Schenck does not mention *fumipennis*, while he gives *albipes* as common. *D. longiventris* is pretty common, while *S. Taschenbergi* has not yet been found in this country. *A. noduli* and *Aph. radicis* are undoubtedly found together, yet I have no hesitation in saying that they are by no means related in the way stated by Adler. *Radicis* is found developed in the galls from the autumn till early spring, and it then deposits its eggs. This point is clearly shown by our finding the fly about oaks in April; the galls are found soft, juicy, and white, with a more or less rosy tinge, towards the middle of May, the larvæ being found in them till the end of July; all this proving positively that *radicis* has only one brood in the year. The galls of *noduli*, on the other hand, appear in the spring, and the insects quit them in the autumn. In other words, the development of the two species goes on side by side. How then can the one give origin to the other? But more than that, I have taken a gall of *radicis* in the spring and placed it at the root of an oak, where I had satisfied myself the species did

* Beitr. z. Kennt. d. Nassauischen Cynipiden.

not abound—not even occurring in the same wood, which was a small one—and in three weeks after in the self same spot I found a fresh gall. It seems to me then clear that Adler's hypothesis is erroneous, and not consistent with fact.

If no alternation of generations takes place, it is evident that the eggs of the vernal species must lie dormant for 9 or 10 months. That they are laid in June (or probably May in some places) is certain from our never finding the flies before the appearance of the galls in the spring, and by bred specimens only living a day or two after leaving the galls; and again we find their dead bodies in spiders' webs, &c., in June, while I have observed *T. megaptera* in copulation at the end of that month. The fact of the eggs lying so long dormant is rendered more extraordinary by the galls in many cases not appearing till the leaves or flowers, as the case may be, are fully grown. But in reality there is nothing more strange in this happening with *S. baccarum*, than that the "spangle" galls should appear in the summer, remain flat and dry without a trace of the insect inside during the autumn and winter, then in the spring swell up, become soft and succulent, the larva inside growing rapidly, and in the course of a week or two emerging in a winged state.

From the extreme sluggishness of these creatures, as well as from the very short time they live as imagos, observations on their oviposition are very difficult to make. I have only once observed it. This was with *Aphilothrix albo-punctata*, on 25th April; the galls followed early in June, and as this species becomes developed in the autumn it must hibernate in the perfect state. This is also the case with *D. divisa* and other agamic forms.

The gall-making Cynipidæ are most sluggish in the perfect state. I have only once observed them fly, that being with some specimens of *A. radicis*, which were bred in the house, and whenever the box containing them was opened, they flew into the gas. (I put some specimens of *radicis* into spirits for a week, and they revived when taken out and dried.)

From the above remarks it is plain that the "Alternation of Generations" of Adler is nearly the same as the "Dimorphism" of the late B. Walsh. According to Walsh, *Cynips spongifica*, O.S. raises "oak apple" galls on *Quercus tinctoria*, which become fully grown about the middle of June, and from a small proportion of the galls emerge ♂ and ♀ flies; the remainder

of the brood do not develope till autumn, when they upheave galls closely allied to, but quite distinct from, the June form, and out of thousands of the autumnal flies bred not one was a ♂. The American entomologist enumerates 9 points of distinction between *aciculata* (this being the name of the autumnal form) and *spongifica*, more than enough indeed for them to be placed in separate genera, according to the way the European species are distributed. The evidence in favour of their connection seems to be by no means clear, and it would be well if the subject were reinvestigated. I have examined a specimen of *aciculata*, and it undoubtedly belongs to the *Cynips*-group, but cannot well be placed in *Cynips* S. Str. *Dryophanta* or *Aphilothrix*.

Arguing from Walsh's observations, Mr. F. Smith has urged that if the galls of our agamic species be collected early in the season the males may in this way be discovered. This has been done, but so far without success. It seems to me that there is no evidence what ever to show that these species are double brooded. Possibly however some of the bisexual vernal species may have more than one brood. Mr. E. A. Fitch mentions (Ent. No. 159, p. 195) that with *Andricus curvator* a small second brood is met with. Mr. J. E. Fletcher of Worcester likewise tells me that this year two broods of *Spath. tricolor* appeared; one on the 11th June, the other on July 23rd.

With the bisexual Cynipidæ the males are in some species nearly as common as the other sex, in others, as in *Rhodites*, they are very rare. A curious phenomenon may occasionally be observed with one or two of the polythalamous gall-makers; it is that from one gall only females will be produced; from another only males, but oftener both sexes will be found in the same gall. In *Synergus* the males are tolerably common, and often differ much from the females. In another inquiline genus—*Ceroptres*—Mayr bred 600 of *C. arator*, and not one ♂, and of *C. cerri* 98 females and only 4 males.

Males are as common as the females with some species of parasitic Cynipidæ, while with others they have not yet been found. Even with those species having both sexes the males are in comparison to the females rare. Thus of *Sarothrus canaliculatus*, I have in my collection 23 specimens, of which only 6 are males; of *Eucoela trichopsila* 11 females and 2 males; of 7 species of *Kleditoma*, numbering in all 35 individuals, there are only 3 males; of *Figites* 23 specimens, and not one

male. In *Ægilips* and *Megapelmus* both sexes are equally common.

Parthenogenesis has been clearly demonstrated in *Nematus ribesii* (*ventricosus*) the common gooseberry sawfly, by the researches of Thorn, Kessler and more especially by Von Siebold, (see his "Beiträge zur Parthenogenesis der Arthropoden" pp. 107-130). In this species the result of the parthenogenetic brood is male, as is the case with *Apis*, *Polistis* and *Vespa*. Parthenogenesis also appears to occur with *Nematus miliaris*, Pz. (*viridis* H.), a very common saw-fly, with 2 or 3 broods in a year, and which has the males nearly as numerous as the females. I had 4 larvæ of *miliaris* in a bottle by themselves. They spun up, and at the end of July 4 females came forth. I supplied them with a fresh willow leaf, and one of the creatures laid 4 or 5 eggs on it, from which in due time larvæ issued, but unfortunately they did not reach maturity, having perished during the winter in the cocoons.

The number of saw-flies of which no males are known is not inconsiderable. There are some widely known species which have been frequently bred, and hundreds caught, yet no males have been discovered. This is the case with *Dineura verna*, *Hemichroa rufa*, *Phyllotoma nemorata*, *Blennocampa luteiventris*, *B. albipes*, *Pœcilosoma pulveratum*, *P. luteola*, *Hoplocampa brevis*, *Eriocampa ovata*, *Fenusa betulæ*. With others again the males are known, but are extremely rare. *Strongylogaster cingulatus* I have taken in hundreds, and have only managed to secure one male, which I bred. *Nematus gallicola* has been extensively bred by Mr. F. Smith, and he only "obtained a single male out of several hundreds of the flies" (Proc. Ent. Soc. Lond. part iii. 1876. p. 22). *Croesus varus* is only known to have a male from the rather doubtful account of its original describer, Villaret; and that of *Blennocampa eppiphium* from a single specimen taken by Brischke (Beitr. zur Parth. a. Arth. p. 228). The ♂ of *Eriocampa adumbrata* is known, but is certainly very rare. The same remark holds good with *Hemichroa alni*, *Selandria straminepes*, and others.

It would be of great interest to prove if species like *Hem. rufa* would produce females without the aid of the male. I am anxious to investigate this subject, and should be greatly obliged for larvæ of the species noted above.

31 Willowbank Crescent, Glasgow, 19th August, 1877.

FURTHER NOTES ON THE SPECIES OF OPORABIA.

By F. BUCHANAN WHITE, M.D., F.L.S.

SINCE the notes at p. 111 were printed, I have seen a copy of M. Guenée's "Phalenites," and consequently can give a translation of some of his remarks on the species of *Oporabia* (vol. ii. p. 262-266).

1333. *O. dilutata*, 40 mm. Front wings light grey, with a slightly yellowish tint, the lines grey, sinuous, bluntly toothed, arranged in bands and always pretty well marked; the subterminal double with larger teeth; the two central sometimes each composed of three lines. The small central spot is contiguous to the second line, and the black apical dash is more or less visible. Hind wings paler, with 2 parallel subterminal lines marked in black at the costa; on the underside there is a third line, also more distinct on the costa, and a black central spot. The ♀ is smaller, with more distinct lines, and the 2 central bands clouded with blackish. This species varies excessively. The ♂s vary from pale greyish sulphur with well-marked lines to smoky grey without markings.

M. Guenée then alludes to the various forms which have been considered as species. The only one of these to which we need refer is *neglectata* Stph. (Brit. Mus. Cat. p. 198), which like many other Scottish insects is larger than more southern individuals. Weaver thought that the antennæ were thicker, but M. Guenée could not detect this in the specimens he has seen.

1334. *O. autumnata* Bdv. Does not vary in size so much as *dilutata*. The four wings are concolorous, silky, dirty white, never greenish; all the lines are partly obliterated, and show well on the costa only. But the black points and dashes of the nervures are persistent, those on the bifurcation of the 2nd and 3rd nervures drawing attention at the first glance. In very well marked examples it can be seen that the second line is straighter, much less toothed, and that it forms upon the 1′ almost a right angle that is not to be seen in *dilutata*. The hind wings and the underside are also only slightly marked. The ♀ resembles the ♂ in all respects, and is of the same size, whilst in *dilutata* the ♀ is smaller and more strongly marked.

1335. *O. filigrammaria* H. S. Allied to *dilutata*, and much more so to *autumnaria*, but is always smaller. Front wings straighter and more produced at the tip. Ground colour always slatey-grey (*gris-violâtre*), with bands darker and more filled up with black;

the line which forms the base of the basal patch is straighter and more oblique. The central space is almost always black, and forms a projecting angle in the cellule. The little band which follows that is more oblique. The hind wing has always a dark band above, preceded below by two equidistant and pretty parallel lines.

Var. A. *Autumnaria* Dbd. (*non* Bdv.) Notably larger (39 mm.) Front wings lighter, though always of a slatey-grey tone. Central space lighter in the middle where the nervures are entirely white ; hind margin paler. Hind wings white with a single blackish line, toothed and disappearing behind. ♀ with the whole of the upper wings traversed by fine lines, the central space filled in with black.

Autumnaria looks certainly different from *filigrammaria*, though "I have not found any important character by which to separate them."

As regards the time of appearance M. Guenée gives October and November for *dilutata*, November for *autumnata*, and, on the authority of Mr Doubleday, the beginning of September for *filigrammaria* and its variety. He also states that *autumnata* occurs in central France, and that the caterpillar, which is velvety-green and unmarked, feeds exclusively upon birch.

From the description and figure given by M. Guenée, it seems clear that the *autumnaria* of our lists, and which I have described at p. 114, is not his species 1334, but the one he describes as a variety of *filigrammaria* under the name *autumnaria* Dbd. No. 1334 *autumnata* Bdv. Gn. appears to be a good species, and may occur in the south of England, but is scarcely likely, perhaps, to be found in Scotland. On the other hand, *autumnaria* Dbd. Gn. seems equally a good species, distinct from *filigrammaria* (as I have attempted to show at pp. 114 and 115), not only in the shape and size of the wings, but in the relative sizes of the sexes and in the armature, &c. As, however, there cannot be in the same genus, without great risk of confusion,* two such similar names as "*autumnata*" and "*autumnaria*," I propose to substitute "*addendaria*" for the latter name.

The synonymy of the species as copied on p. 112 from Staudinger's Catalogue should thus be amended as follows :—

1. DILUTATA (S.V. p. 109, n. Cat.) Bkh., &c., &c. Gn. No. 1333; Staudinger, No. 2642.
   a. ab. *Obscurata* Stdgr., *l.c.*

* For example, at p. 265 M. Guenée has used "*autumnaria*" when he clearly means "*autumnata.*"

2. AUTUMNATA Bdv. Gn. No. 1334 ; Stdgr. No. 2642.
3. ADDENDARIA B. White. *Autumnaria* Dbd. (*non* Bdv.) ; Gn. No. 1335 A. ; Stdgr. No. 2643 a ; B. White, Sc. Nat., iv. pp. 114 and 115, pl. I. B.
4. FILIGRAMMARIA H.S. 194-5, iii. p. 160; &c., &c. Gn. No. 1335 ; Stdgr. No. 2643.

Colias Edusa in Orkney.—My neighbour, Mr. Stuart M. Burnett, saw a specimen of *Colias Edusa* in Harray, Orkney, on the 19th of last month (June), and chased it for some time—unsuccessfully however. He was quite close to it and distinctly recognised the species, having taken it in England.—W. TAIT, Broomend, Inverurie, Aberdeenshire, July, 9 1877.

Colias Edusa in South West of Scotland.—For the last ten days or so I have begun to see the second brood of *Edusa*, of which the first brood was not uncommon in June.—W. D. ROBINSON-DOUGLAS, Orchardton, Castle Douglas, September 3, 1877.

Mustela erminea.—When on a visit to a friend in Newton-Stewart lately he showed me a stuffed Ermine, which had been caught in the Wood of Cree, near Newton-Stewart, in the gamekeeper's trap. He told me that several more had been caught in the same way, and that the gamekeepers called them "white weasels."—JAMES M'ANDREW, New Galloway.

NOTE ON THE ZOOLOGY AND BOTANY OF GLEN TILT.

BY F. BUCHANAN WHITE, M.D., F.L.S.

IT was my intention to have given the readers of the *Scottish Naturalist* some account of the natural history of Glen Tilt, but this must be relinquished till a future occasion. In the meantime, there are a few species that I wish to take an opportunity of noticing.

During a visit to Glen Tilt last July, I was especially struck with the wide range, and abundant occurrence, of a species of *Orthezia*, an insect belonging to the Cochineal family (or *Coccina*) of the *Hemiptera*.

Without close examination this insect would very likely be passed over as the common *O. urticæ* L., and it is only by a careful study of the admirable descriptions and figures given by M. Signoret, in his essay on this family, in the "Annales de la Société Entomologique de France," and by comparison with specimens of what I take to be the true *urticæ*, that I have come to

he conclusion that the Glen Tilt *Orthezia* belongs to an undescribed species, which I may characterise as follows :—

Orthezia Signoreti Buchanan White, *sp. n.*

O. *Orthezicæ urticæ* L. persimilis; antennis brevioribus et proportionaliter robustioribus ; tarsis tibiis subæquilongis ♀.

Very similar in size and general appearance to *O. urticæ*. As in that species the eggs, when laid, are contained in a calcareous bag that projects from the hind body of the ♀, and in which, after they are hatched, the embryonic larvæ remain for some time. The antennæ of the embryonic larva is 6-jointed, as in *urticæ*, but the joints seem to be thicker, and less narrowed at their bases ; the 2nd joint not so much narrowed in comparison with the first, and both with more hairs, the 1st having a good many, and the 2nd with 4 on the inner side and at least 2 (near the apex) on the outer ; the last joint has 2 long hairs at the tip, one rather shorter than the other. In length, the 6th joint equals the 4th, 5th, and ⅓ of the 3rd ; the 2nd equals the 3rd, and the 1st equals the 2nd and ½ of the 3rd.

The ♀ larva has 7 joints to its antennæ, of which the last joint is the longest, and the second the next in length ; the 4th, 5th, and 6th joints are nearly equal in length.

I have only seen one ♂ larva, and that not in good condition ; but as far as I could judge, the antennæ resemble in structure that of the ♂ larva of *urticæ*.

The adult ♀ has 8-jointed antennæ, the relative lengths of the joints being much the same as in *urticæ*, viz., the 8th longest, the 2nd nearly as long as the 8th, and the 3d next in length ; the whole antenna is, however, shorter and stouter, and more of an equal thickness throughout, the last joint being conspicuously thicker than in *urticæ*, in which the antennæ gradually taper to the tip. The tarsus is nearly as long as the tibia, instead of being little more than half the length as in *urticæ*.

I have not seen the ♂.

Orthezia Signoreti lives below mosses, and occurs probably over all the northern half of Scotland. In Glen Tilt it was especially abundant, and not least so at an elevation of upwards of 3000 feet, where it lives in the cushions of *Rhacomitrium lanuginosum*. *O. urticæ* is also a Scottish species, but the only specimens I have are from the south-west. (Plate II. fig. 1.)

M. Signoret cites 9 other described species, but thinks that, from the

insufficent descriptions, they must be considered merely as synonymous with *urticæ* L.

The antennæ of *O. Signoreti* are frequently deformed, 2 joints often coalescing to form a single joint.

The other species that I wish to notice just now are some undescribed fungi, which I found in Glen Tilt in July and August last. For the elaboration of these I am very greatly indebted to the Rev. M. J. Berkeley.

Dactylium spirale B. and B. White, *sp. n.*

D. candidum e maculâ tostâ oriundum; floccis simplicibus spiralibus; sporis magnis uniseptatis medio constrictis utrinque obtusissimis.

On living leaves of *Polygonum viviparum*. Glen Tilt, reaching an altitude of 1800 feet.

Flocci .004 inch long; spores .0009-.0012, half as much wide. (Pl. II. fig. 3.)

Dactylium modestum B. and B. White, *sp. n.*

D. candidum e maculâ tostâ oriundum; floccis subrectis vel leviter flexuosis; sporis magnis uniseptatis elongatis medio constrictis.

On the underside of fading leaves of *Alchemilla alpina*. Glen Tilt (alt. about 1300 feet); Loch Killein, Inverness-shire (alt. about 1000 feet).

Closely allied to the last, and distinguished not only by the flexuous threads but by the very different spores.

Flocci .004 inch long; spores much narrower than in *D. spirale*. (Pl. II. fig. 2).

Bactridium acutum B. and B. White, *sp. n.*

B. candidum parasiticum; sporis deorsum attenuatis, apice acutis, 1-3-septatis, articulo penultimo tumido.

On the hymenium of *Peziza cochleata*. Glen Tilt.

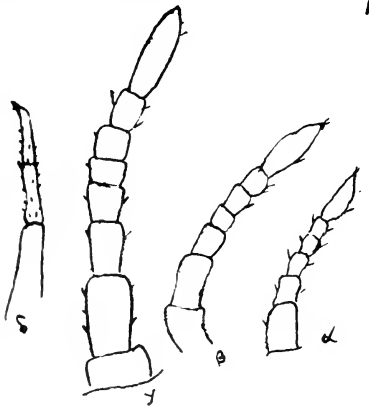
Distinguished from *Bactridium helvellæ* by its constantly very acute apex and attenuated base. (Pl. II. fig. 4.)

Milesia B. White, *g. n.*

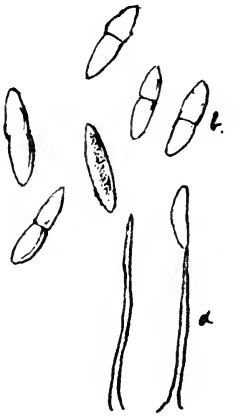
Peridium endophyllum reticulatum, basi inter cellulas matricis radicante; sporæ obovatæ echinulatæ ex ostiolo minuto demum ejectæ.

Allied to *Endophyllum* Lév. Peridium minute, reticulated, im-

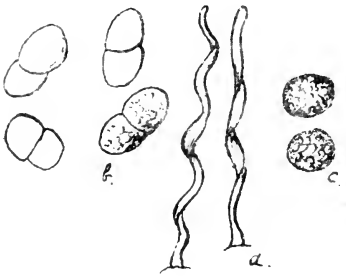
1.



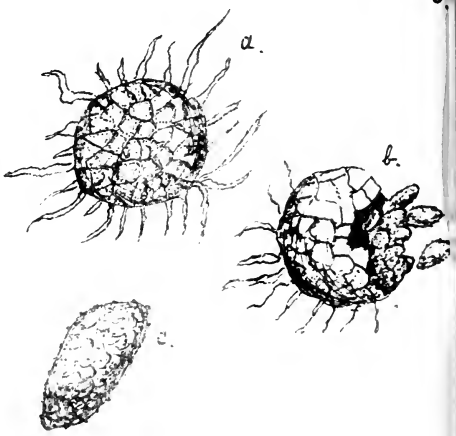
2.



3.



5.



4.

6

7.

mersed in the substance of the matrix, into which the base sends root-like fibres. Spores distinctly spiny, ejected copiously from a minute ostiolum at the summit of the peridium.

It is with very great pleasure that I dedicate this genus to the Rev. Miles Joseph Berkeley, M.A., F.L.S., to whose researches our knowledge of the mycology, not only of Britain, but of every part of the world, is so deeply indebted, and whose kindness to all students of the same branch of botany is as well known as it is unfailing.

Milesia polypodii B. White, *sp. n.*

M. hypogeneum ; peridiis sphæricis minutis, pallidis, dispersis ; sporis albidis obovatis echinulatis.

On the underside of living but fading leaves of *Polypodium vulgare* in June and July. First found in the Den of Reichip ; then in other parts of Perthshire.

Spores .0012—.0017 inch long. (Plate II. fig. 5.) The peridia are scattered in an irregular manner on the underside of the frond of the fern, and looks under a lens like little pallid mammiform projections very slightly elevated. The spores are ejected copiously from the ostiolum, and from their whitish colour and abundance are very perceptible. The spores themselves appear under the microscope to be filled with a granular matter.

I take this opportunity of figuring the uredo spores of *Uredo (Puccinia) pteridum*, B. White, described at page 26 of this volume. For the sake of comparison the spores of *U. filicum* Desm. are also figured on the same scale.

EXPLANATION OF PLATE II.

Fig. 1. *Orthezia Signoreti* B.W. *a.* antenna of embryonic larva. *β.* antenna of ♀ larva. *γ.* antenna of adult ♀. *δ* tibia and tarsus of adult ♀.

Fig. 2. *Dactylium modestum* B. and B. W. *a.* flocci. *b.* spores.

Fig. 3. ,, *spirale* B. and B. W. *a.* flocci. *b.* spores (side view). *c.* spores (end view).

Fig. 4. *Bactridium acutum* B. and B. W.

Fig. 5. *Milesia polypodii* B. W. *a.* peridium. *b.* peridium burst. *c.* spore.

Fig. 6. *Puccinia pteridum* B. W. uredo spores.

Fig. 7. *Uredo filicum* Desm. spores.

For figures 2, 3 and 5, I am much indebted to Mr C. E. Broome.

MARINE BIOLOGICAL LABORATORY WOODS HOLE

PHYTOLOGY.

DESCRIPTIONS OF NEW LICHENS.

By JAMES STIRTON. M.D., F.L.S.,

Pannaria lasiella n.s.—Thallus obscure vel nigricanti-virescens, microlepideo-squamulosus vel minute corallideo-granulosus, crassiusculus, hypothallus niger crassus (crassit. 1-2 mm.) spongioso-contextus radiculosus (radiculis, latit. .004-.0055 mm.); apothecia nigra lecideina (interdum obscure rufa), rotunda vel flexuosa, innato-sessilia plana, acute marginata (latit. .5-1.7 mm,); sporæ incolores simplices, ellipsoideæ vel fusiformi-ellipsoideæ, episporio nonnihil crenulato, .014-.018 × .007-.009 mm.; paraphyses distinctæ, articulatæ, crassæ (latit. .0025-.0035 mm.), apicibus nigris conglutinatis; hypothecium fuscescens vel (in lamina crassiuscula) fuscum vel fusco-nigrum. Iodo gel. hym. cœrulescens dein vinose rubens vel vinose fulvescens.

Supra *Hepaticas* (*Frullanias*) prope Garve.

This lichen plays between *P. triptophylla* and *P. nigra*, and approaches the former perhaps too much.

Lecidea antiloga n.s.—Thallus vix ullus visibilis; apothecia intus ob. praesertim supra, adnata nigra minuta (lat. .1-.25 mm.) plana marginata, margine nitidiusculo; sporæ 8næ incolores simplices sphæricæ (latit. .004-.0055 mm.); paraphyses valde indistinctæ; hypothecium incolor. Iodo gel. hym. cœrulescens dein obscurata vel obscure violacea.

Ad lignum decorticatum prope Aviemore.

There are scarcely any paraphyses properly so called, and even liq. potassæ does not render them in any way distinct. The hymenium becomes darker upwards and the epithecium is nigricant or virescenti-nigricant. This lichen can scarcely be an *Arthonia*.

Lecidea uliginascens n.s.—Similis *L. uliginosæ* sed apotheciis nigris, majoribus et intus K. violacee tinctis vel violacee dissolutis. Thecæ confertæ, sporæ .01-.013 × .006-.007 mm., paraphyses parcæ irregulares graciles; hypothecium fusco-nigrum. Iodo gel. hym. leviter vel vix cœrulescens dein obscure vinose rubens.

Supra terram turfosam prope Garve, cum *L. uliginosa* intermixta.

Lecidea endocyanea n.s.—Thallus cinereus vel cinereo-niger vel etiam niger, squamuloso-diffractus, squamulis planis vel convexiusculis adpressis (K—C—); apothecia fusco-nigra primum parva et urceolata, demum expansa plana vel convexa et immarginata, sessilia, intus, fere omnino sed praesertim supra, violacea (latit. .2-.5 mm.); sporæ in thecis cylindraceis infra attenuatis, 8næ ellipsoideae vel oblongo-ellipsoideæ, incolores simplices, .011-.014 × .006-.007 mm.; paraphyses distinctæ filiformes apicibus intricate contextis; hypothecium leviter fuscescens vel fere incolor. Iodo gel. hym. cœrulescens dein passim flavescens et thecæ fulvescentes.

Saxicola in Mull.

The epithecium is composed of the apices of the paraphyses densely and inextricably compacted, and, overlying this, in very many instances if not in all, is another dense granular layer of a still deeper colour. A thin section of an apothecium reveals a beautiful violet colour, which deepens upwards, and is rendered a dirty bluish-green by K. The thecæ are composed of thickish and apparently toughish walls, while in the specimens examined, few matured spores have been detected.

This lichen is allied to *L. tenebrosa* (Flot.) but certain characteristics seem to indicate affinities to the genus *Milaspilea*.

Lecidea interpolata n.s.—Thallus fuscus vel nigro-fuscus vel etiam niger, minute squamuloso-areolatus, areolis adpressis contiguis, vel dispersis, determinatus, hypothallus niger; apothecia nigra, adnata parva (latit. .2-.3 mm.), plana marginata; sporæ 8næ in thecis saccatis, ellipsoideæ virescentes vel fuscæ, 1-septatæ, binucleatæ, nucleis majusculis plerumque virescentibus et interdum a tubula conjunctis; paraphyses graciles non bene discretæ, apicibus fusco-nigris clavatis conglutinatis; hypothecium incolor. Iodo gel. hym. cœrulescens dein obscure violacea, thecæ vinose fulvescentes.

Saxicola prope Garve. Affinis *L. aberranti* (Krph.).

Lecidea sporeta n.s.—Thallus albidus, disperso-squamulosus, squamulis parvis adpressis planis vel convexulis et interdum crenulatis (K— C—); apothecia confertissima, fusca vel fusco-nigra, adnata, plana, obtuse marginata nitidiuscula parva (latit. .2-.4 mm.); sporæ 8næ incolores ellipsoideæ simplices, .011-.015 × .005-.006 mm.; paraphyses non bene discretæ, fere conglutinatæ apicibus fuscescentibus; hypothecium incolor. Iodo gel. hym. cœrulescens dein fulvescens.

Saxicola in insula Mull.

Lecidea pissodes n.s.—Thallus fusco-badius vel fusco-niger, squamuloso-diffractus, squamulis parvis concaviusculis vel planis (K— C—); apothecia conferta nigra, innata parva (latit. 1.5-2.5 mm.), plana tenuiter marginata; sporæ 8næ incolores oblongæ simplices, .007-.01 × .0035-.0045 mm.; paraphyses non distinctæ irregulares graciles, apicibus nigris vel sordide cœruleo-nigris, conglutinatis; hypothecium incolor. Iodo gel. hym. cœrulescens dein fulvescens.

Saxicola in insula Mull.

The thallus viewed by the naked eye has a pitch-black appearance owing to the prevalence of the apothecia.

Lecidea orphnœilla n.s.—Thallus niger opacus, minute granuloso-furfuraceus, continuus, bene evolutus; apothecia intus pellucida, nigra sessilia, plana vel convexiuscula, opaca marginata, margine nitidiusculo sæpe flexuoso vel lobato-irregulari vel etiam lobato-inciso; sporæ 8næ incolores oblongæ vel fusiformi-oblongæ, simplices, .013-.018 × .003-.004 mm., paraphyses crassiusculæ non bene distinctæ fere conglutinatæ, apicibus nigris vel cœruleo-nigris crasse clavatis conglutinatis; hypothecium incolor. Iodo gel. hym. intense cœrulescens fere nigra.

Saxicola, Mull.

The epithecium is thick, black, and rendered sordidly violascent by nitric acid, while K. has no visible reaction on it or on the thalamium throughout.

Lecidea Mullensis n.s.—Thallus cinereus vel nigro-cinereus, areolato-verrucosus, diffractus (K supra flavens, intus fl. dein ferrugineo-rufus), quasi a columellis (alt. .6-1.3 mm.), erectis, connatis vel passim segregatis et dispersis com-

paginatus; apothecia nigra subinnata, parva (lat. circ. .3 mm.), plana, acute marginata, margine sæpe flexuoso vel undulato; sporæ 8næ incolores ellipsoideæ simplices, .006-.009 × .004-.006 mm., paraphyses valde irregulares et non distinctæ, nigro-apiculatæ; hypothecium fuscum vel fusco-nigrum, crassiusculum. Iodo gel. hym. vinose rubens (praecedente cœrulescentia obsoleta vel nulla) Saxicola, Mull.

K. added to the hymenium developes first a yellow colour, and soon thereafter stellate groups of reddish acicular crystals. The thecæ, especially the immature, have, upwards, thick pellucid walls. Only a few *detached* spores have been seen, and none, it is believed, in a mature state.

In August of 1876 I picked up a *Lecidea* near Salen in Mull, whose characteristics may be given as under, and to which I gave the name *L. contortula.*

Thallus pallide cinerascens vel nonnihil plumbeo-cinerascens crassiusculus, rugosulus, rimoso-areolatus (K—C—); apothecia nigra adnata majuscula (latit. 1-2 mm.) plana vel convexiuscula, crasse marginata, umbonata et gyroso-plicata; sporæ 8næ incolores simplices, oblongæ vel fusiformi-oblongæ, .015-.021 × .006-.0075 mm.; paraphyses mediocres, satis bene distinctæ, fusco-apiculatæ; hypothecium fusco-nigrum supra fuscum. Iodo gel. hym. cœrulescens dein vinose rubens praesertim thecæ. Saxicola.

A comparison of this with the more recently discovered *Lecideæ* reveals a near affinity, if not identity, with *L. subumbonata* (Nyl.) described in "Flora" 1876 p. 236.

By the way, the distinction *subumbonata* had previously been given to another *Lecidea* also described in Flora 1872, p. 358, and ought, accordingly, to be changed; but as I have no wish to emulate the rather sharp practice which prevails pretty extensively on the continent, I merely throw this out as a hint to those more immediately concerned in the matter. To be sure the two lichens indicated under the same name are rather closely allied, but according to modern ideas of specific distinction it is scarcely likely that the two descriptions are meant for the same lichen.

The point concerning the *Lecidea* from Mull to which I wish to draw attention is this: The application to the thalamium of a solution of Iodine of the strength recommended is immediately

followed by a blue reaction especially in the upper $\frac{4}{5}$ of the thalamium. In a very short time thereafter the thecæ are seen to assume a beautiful and deep vinous red colour. On the application of more of the solution, those parts of the thalamium immediately adjoining the thecæ are also seen to assume the same vinous red tint, and on the whole being saturated, a thin section reveals the vinous red tint throughout. Now, as a strong element in specific distinction is being founded on the differences between the reactions of the general thalamium and thecæ proper, at what stage of the process detailed above ought observation to stop? It is clear, that had a stronger solution of Iodine been used than that commonly recommended the last phase of the reaction would have appeared almost immediately after the first. As this is merely the first of a series of observations on the use of chemical re-agents, in the discrimination of species of lichens, I shall defer to another opportunity what I have to say further on the subject.

SCOTTISH GALLS.

By JAMES W. H. TRAIL, M.B., F.L.S.

DURING the past month I have found a few galls not previously known to me, descriptions of which I subjoin. I may add that I should be glad of any help towards adding to our knowledge of galls in Scotland; from many, in fact from most parts of the country, our information about these productions is very scanty or is entirely wanting.

Thlaspi arvense L.—The galls consist of rounded swellings projecting from one side of the root just below the base of the stem; they usually include more than half the circumference of the stem, and may reach ¼ inch in diameter. Externally they resemble the root; internally they are found to be composed of rather hard tissue, enclosing a cavity varying in size according to the development of the larva. I have not succeeded in rearing the gall-maker, but I have litttle doubt that it is a species of weevil (*Ceuthorhynchus*). Galled plants were abundant in July in a field near Old Aberdeen.

Lotus major L.—The galls on this plant resemble those of *Cecidomyia Loti* De Geer on *Lotus corniculatus*, and are most probably the work of the same insect. One or more

flower-buds in each cluster become greatly swollen and fleshy, oval, deep red externally on the sides exposed to light, and either do not reach the stage of flowering, or produce only much distorted flowers. All the organs of the flower become thick and fleshy, and shelter between them several larvæ. The galls were not rare on a clump of *L. major* at Murcar, in the neighbourhood of Aberdeen, in August.

VICIA CRACCA L.—(*b*) Galls of *Apion Gyllenhallii*, Schk. These galls are swellings of the stem just above a node, or of the base of a branch, or of a petiole or of a peduncle; they involve the whole circumference of the part affected which becomes about twice as thick as in the normal state, the gall usually being about $\frac{1}{4} \times \frac{1}{8}$ inch. The surface is like that of the part on which it is borne, and usually shows prominent longitudinal ridges. The walls are thin, enclosing a rather large cavity tenanted by one larva. The galls occurred not uncommonly in various localities near Aberdeen during July and August, and at Cluny on Donside in August. The beetles emerged a few days after the galls were gathered. To Dr. Sharp I am indebted for their name.

PYRUS ARIA L.—Galls of *Phytoptus* on the leaves. They are very similar to those on *Pyrus Aucuparia* (Sc. Nat. II, 79), being blister-like spots projecting considerably from the lower surface, but either level with the upper epidermis or somewhat depressed above where a yellow spot appears, becoming brown from the centre outwards; the lower surface bears a tomentum, and resembles the rest of the leaf. Each gall is $\frac{1}{10}$ to $\frac{1}{5}$ inch in diameter, but very often two or more coalesce more or less perfectly. On section they are found to consist of a loose tissue of elongated cells, among which live scattered mites (*Phytoptus*, .0064 × .0002 inch). Sometimes hundreds of galls occur on a leaf. Common on a small tree at Rubislaw Quarries near Aberdeen, in August.

GALIUM SAXATILE L.—(*c*) Galls of *Cecidomyia (Galii* Winn. ?) They are swollen flowerbuds which resemble (*b*) in appearance, reaching a size of about $\frac{1}{12}$ inch in diameter, without being much altered in appearance otherwise. They seldom open, and on section are found to contain

one or more orange larvæ of *Cecidomyia*, among the swollen fleshy internal organs of the flower. Near Aberdeen, on the Links, in August.

VERONICA SERPYLLIFOLIA L.—Galls of *Cecidomyia*. Like those just described, these consist of dilated and abortive flower-buds, several on each spike, reaching a size of $^1/_{12}$ to $^1/_{10}$ inch in diameter, without other very noticeable change save that the colour is paler green than usual. On section each bud is found to contain one or two orange-red larvæ among the fleshy representatives of stamens and pistil. I found the galls in a shady spot in Rubislaw Den, near Aberdeen, in August.

Berteroa incana D.C.—Recently I have found a few specimens of this rare casual growing in a grass field in my glebe. The grass seed was home-grown, and sown with oats, also home-grown, so I cannot suggest how the plant can have been introduced. I may mention that Mr. A. Sturrock has recently found *Allium oleraceum* in this neighbourhood.—W. HERDMAN, Rattray, September, 1877.

BOG-MOSSES.

IT is with much pleasure that I have spent some time over Dr. Braithwaite's very interesting "*Sphagnaceæ Britannicæ Exsiccatæ.*"

The *Sphagna* or Bog-mosses, which beautify our marshes and moorlands, are a peculiar and interesting class of plants, and though to the utilitarian mind they may be regarded as merely the principal producers of peat banks, which supply fuel to so many households in rural districts, to the microscopist the leaves, cortical cells, and inflorescence form objects of great beauty as well as scientific interest. To the common observer, the great variety of colour, from the deepest green or yellow, to the brightest red or purple, and the beauty of form and structure, from the tiniest stem, with its fascicles of drooping branches, to the densest masses spread out like great cushions on the moor, or the fine contorted stems straggling in the little streamlet or filling up the shallow pools, there is very much to attract the eye and interest the mind.

The scientific botanist finds in the *Sphagna* many peculiarities. Unlike most other plants they are not attached to their place of growth by rootlets, nor is their nutriment drawn in by such, but part of each fascicle of branches is disposed in a drooping manner and closely applied to the stem, by which the sap is supposed to be carried upwards through a set of curiously curved

cortical cells to nourish the plant; nor is an exact place in the vegetable kingdom easily assigned to them, standing as they are supposed to do between the *Hepaticæ* and the true mosses, but generally included among the latter. It seems to me that they might well form a distinct division by themselves, as far separated as the *Hepaticæ* from the true mosses. Nor is their division into sections and species by any means easy. Under these circumstances such a work as that now presented to us by Dr. Braithwaite cannot but be welcomed by every one studying the family. The specimens are beautifully dried and pasted on white paper, and in addition are loose specimens enclosed in a little envelope, for miscroscopic use. The collection has been gathered from various places throughout the British Islands, and in a few cases where the species is but sparingly found in Britain, foreign specimens have been used to fill their place. The whole have been collected by men well known as bryologists, and each packet thoroughly examined by Dr. Braithwaite, who has made the *Sphagna* his special study for many years. We have thus before us a work which may be relied upon as authoritative, and the value of the work as a collection of British *Sphagna* will grow with its age.

There are seventeen species shown in the work, and thirty-six varieties, besides many forms exhibiting a character which is very apparent in the *Sphagna*, that of every good variety varying from the tiniest form to the densest. I scarcely think it important to say much upon what might be accounted a species or only ranked as a variety, as the term species is simply a convenient one to indicate such forms as are more definable than others, and in the present work there is almost no change in that way but which has not been already adopted by Schimper in his Synopsis of European Mosses. Still I cannot help feeling that *S. rubellum* of Wilson, being a *dioicous* species, has the same claim as *S. strictum*, which arises from *S. fimbriatum* in the same way as *S. rubellum* does from *S. acutifolium*, although I am not sure but both might be better simply set down as varieties. And *S. papillosum* I must say I do not at all understand and have never seen any reason for its being recognised as a species. Nor is it necessary to refer very much to the nomenclature, although the older names should in all cases be preferred, and certainly that of *S. rigidum*, Schimper, as adopted by Dr. Braithwaite, is no improvement on *compactum* Brid., which is the older name; nor do I think *S. subsecundum* any improvement on *contortum*. But I think the grouping of them into divisions is a more important matter, and scarcely meets my view in this or any of the other works on *Sphagna* that I know.

The system adopted in the present work is pretty much Dr. Braithwaite's own, being nearly Schimper's system reversed, only in section *D.-Cuspidata* of this work is included Schimper's three divisions—*Acutifolia*, *Cuspidata*, and *Squarrosa;* while the *Mollia* of Schimper's is *Truncata* of Braithwaite. But neither system is very much to my mind: still I would prefer that of the present work to that of Schimper's Synopsis, *Truncata* being a better name for a division, including *S. molle*, *S. Angstromi*, and *S. rigidum*, than *Mollia*, that being inconsistent with the character of *rigidum* and even *Cuspidata*, fully equal to the three terms used by Schimper. But I think a more natural division than either would be to divide the whole *Sphagna* into three classes, having reference to the stem leaves alone—the first *Fimbriata*, having the stem leaf fimbriated; and the second *Acuta*, having

the stem leaf acute and sometimes toothed. The following would be pretty much the order I would propose adopting.

* Spirals in cortical cells.

Fimbriata.

CYMBIFOLIA.

S. Austini
S. papillosum
S. cymbifolium

* * Without spirals in cortical cells.

ACUTIFOLIA.

† Stem leaves squarrose.

S. squarrosum
,, var. *squarrulosum*
,, var. *teres*

† † Stem leaves imbricated.

S. strictum
S. fimbriatum

Acuta.

† † † Stem leaves large drawing to a point.

S. Angstromi
S. molle

† † † † Stem leaves scarcely toothed.

S. acutifolium and its varieties

CRISPA.

S. intermedium and its varieties
S. cuspidatum and its varieties
S. Wulfii
S. Lindbergii

SUBSECUNDA.

S. contorta
,, var. *subsecundum.*
,, var. *obesum*
,, var. *auriculatum*
S. laricinum
S. molluscum
,, var. *longifolium*

† † † † † Stem leaves very small ovate.

S. compactum.

By this system the two great divisions refer entirely to the stem leaves, and the minor divisions principally to the branch leaves, by which the botanist in the field with an ordinary pocket lens may easily determine the place of his *Sphagna* as he collects them. *S. compactum* alone is excluded from the two divisions and must take a separate place by itself, and I can not quite see the reason for Dr. Braithwaite and other botanists associating it with *molle* which is evidently nearly connected with some of the varities of *S. acutifolium.* Yet notwithstanding these differences in opinion regard ing the arrangment and nomenclature of the *Sphagna* Dr Braithwaite's work is one that well deserves a place in every scientific library.—JOHN SIM, Banchory, September, 1877.

INSECTA SCOTICA.

THE LEPIDOPTERA OF SCOTLAND.

(Continued from p. 128.)

EDITED BY F. BUCHANAN WHITE, M.D., F.L.S.

UNIDENTARIA Hw. Not common. Nemoral.

DISTRIBUTION—EAST. ♀ ♀ Tay o o o o o
WEST. Solway Clyde o o o

LAT. 54°40′-56°40′. RANGE IN EUROPE. Britain, North Germany (? Finland, &c.) TYPE. Occidental. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. July, August. FOOD-PLANT. Low plants.

MELANIPPE Dup.

FLUCTUATA L. Common. Hortensal. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀
Orkney ♀
WEST. Solway Clyde ♀ West-Ross ♀

LAT. 54°40′-59°10′. RANGE IN EUROPE. Throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE--IMAGO. April-August. LARVA. June-September. FOOD-PLANT. Cabbage &c.

Scottish specimens have almost invariably the ground colour much suffused with fuscous, and and seem to form a melanochroic race.

GALIATA Hb. Not uncommon. Maritime and ericetal. Ascends to 1400 feet.

DISTRIBUTION—EAST. Tweed Forth Tay [Dee] o o o o
WEST. Solway Clyde o o o

LAT. 54°50′-57°. RANGE IN EUROPE. Central and Southern. TYPE. Centro-meridional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. July, August. FOOD-PLANT. Bedstraw.

MONTANATA Bkh. Abundant. Nemoral. Ascends to 1650 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ⊗ Orkney ⊗
WEST. Solway Clyde ⊗ West-Ross Hebrides.

LAT. 54°40′-59°-10′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE.—IMAGO. June-August. LARVA. August-May. FOOD-PLANT. Low-plants.

SOCIATA Bhk. (1794); *subtristata* Hw. (1803). Common. Nemoral. Ascends to 1800 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ⊗ o o
WEST. Solway Clyde ⊗ West Ross ⊗

LAT. 54°40′-57°40′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May-July. LARVA. July, August. FOOD-PLANT. Low plants.

TRISTATA L. Not uncommon. Nemoral and ericetal. Ascends to about 1700 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray Sutherland o o
WEST. Solway Clyde Argyle ⊗ ⊗

LAT. 54°40′-58°40′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August, September. FOOD-PLANT. Bedstraw and other low plants.

HASTATA L. Not common. Nemoral and ericetal. Ascends to above 1000 feet.

DISTRIBUTION—EAST. ⊗ Forth Tay ⊗ Moray o o o
WEST. Solway Clyde Argyle West-Ross ⊗

LAT. 54°40′-57°40′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August. FOOD-PLANT. Birch and *Myrica*.

ANTICLEA Steph.

SINUATA Hb. Rare. Ascends to 1000 feet.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o o

LAT. 56°20′-56°35′. RANGE IN EUROPE. Central; Finland &c. TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June. LARVA. July, August. FOOD-PLANT. Bedstraw.

BADIATA Hb. Common. Hortensal &c.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40′-57°40′. RANGE IN EUROPE. Central; Finland &c. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. March, April. LARVA. May, June. FOOD-PLANT. Rose.

Only single brooded in Scotland? Further south it appears again in July.

NIGROFASCIARIA Goeze. (1781); *derivata* Bkh. (1794). Not very common. Hortensal &c.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40′-57°40′. RANGE IN EUROPE. Central; Finland &c. Type. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. April, May. LARVA. May, June. FOOD-PLANT. Honeysuckle, rose.

The two other English species ought to occur.

THERA Steph.

JUNIPERATA L. Var. *scotica* B.W. Not uncommon. Amongst juniper. Ascends to 1400 feet.

DISTRIBUTION—EAST. Tweed ♀ Tay Dee Moray o o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40′-57°40′. RANGE IN EUROPE. Central, Finland &c. (the type); Scotland (the var.) TYPE. Central. TYPE IN BRITAIN. Scottish (the var.)

TIME OF APPEARANCE—IMAGO. October. LARVA. July, August. FOOD-PLANT. Juniper.

This species has been reported to occur in Scotland in August, but the next species was mistaken for it.

SIMULATA Hb. Very local. Amongst juniper. Ascends to above 2000 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. o Clyde ♀ ♀ o

LAT. 55°40′-57°40′. RANGE IN EUROPE. Britain, Belgium, Lapland, Pyrenees, Alps, &c. TYPE. Occidental. TYPE IN BRITAIN. British.

TIME OF APPEARANCE.—IMAGO. July, August. LARVA. June. FOOD-PLANT. Juniper.

THE COLEOPTERA OF SCOTLAND.

(Continued from p. 132.)

EDITED BY D. SHARP, M.B.

LUCANIDÆ.

SINODENDRON Er.

CYLINDRICUM L. In the wood of old trees. Rare.

DISTRIBUTION—EAST. o o Tay Dee Moray o o o

WEST. o o o o o

SCARABÆIDÆ.

ONTHOPHAGUS Er.

NUCHICORNIS L. Very rare.

DISTRIBUTION—EAST. o o o o o o o o

WEST. o Clyde o o o

"Ayrshire, Mr. J. P. Duncan." Murray Cat.

OVATUS L. In sheep's dung. Very local.

DISTRIBUTION.—EAST. ♀ Forth o o o o o o

WEST. o o o o o

APHODIUS Er.

ERRATICUS L. Not common.

DISTRIBUTION—EAST. Tweed Forth o o o o o o

WEST. Solway ♀ o o o

[HÆMORRHOIDALIS L.

DISTRIBUTION—EAST. o Forth o o o o o o

WEST. o o o o o

"Fields near Colinton and irrigated meadows at Restalrig." Ent. Edin. : probably recorded erroneously.

FOSSOR L. Not common.

DISTRIBUTION—EAST. ♀ ♀ ♀ Dee ♀ o o o

WEST. Solway ♀ o o o

SCYBALARIUS Fab. Not common.

DISTRIBUTION—EAST. ♀ Forth ♀ ♀ Moray o o o

WEST. ♀ ♀ o o o

FŒTENS Fab. Very rare.

DISTRIBUTION—EAST. ♀ Forth o o o o o o

WEST. ♀ ♀ o o o

I found a colony of this species at North Queensferry, June 30th. 1865. D. S.

FIMETARIUS L. Very abundant.
DISTRIBUTION—EAST. ꝏ Forth Tay Dee Moray ꝏ ꝏ ꝏ
WEST. Solway Clyde ꝏ ꝏ ꝏ

ATER De Geer. Abundant.
DISTRIBUTION—EAST. ꝏ Forth Tay Dee Moray ꝏ ꝏ ꝏ
WEST. Solway Clyde ꝏ ꝏ ꝏ

CONSTANS Duft. Very local.
DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o o

Common in ox-dung at Rannoch in the first week of May, 1866. D. S.

LAPPONUM Gyll. Highland. Common in sheep's dung on moors and hillsides.
DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ꝏ ꝏ ꝏ
WEST. Solway Clyde ꝏ ꝏ ꝏ

FŒTIDUS Fab. Very local. In sheep's dung.
DISTRIBUTION—EAST. o Forth Tay o o o o o
WEST. o Clyde o o o

PUTRIDUS Cr. Local. In sheep's dung.
DISTRIBUTION—EAST. ꝏ Forth Tay Dee ꝏ o o o
WEST. ꝏ ꝏ o o o

NEMORALIS Er. Rare. In sheep's or deer's dung in woods.
DISTRIBUTION—EAST. o o Tay Dee o o o o
WEST. o o o o o

SORDIDUS F. Rare.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

"Not common near Edinburgh; Fife." Murray Cat. I have never found the species in Scotland. D. S.

RUFESCENS Fab. Common in the south.
DISTRIBUTION—EAST. Tweed Forth o o o o o o
West. Solway ꝏ o o o

INQUINATUS Fab. Local.
DISTRIBUTION—EAST. Tweed. Forth o o o o o o
WEST. ꝏ ꝏ o o o

CONSPURCATUS L. Very rare.
DISTRIBUTION—EAST. o Forth Tay o o o o o
WEST. o o o o o

TESSULATUS Cr. Very local.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o. o o o o o

PORCUS Fab. Rare.
DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway ♀ o o o

PUSILLUS Hbst. Not rare.
DISTRIBUTION—EAST. ♀ Forth Tay ♀ ♀ o o o
WEST. Solway. ♀ o o o

MERDARIUS Fab. Common.
DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray ♀♀ ♀♀ ♀♀
WEST. Solway ♀♀ ♀♀ ♀♀ ♀♀

PRODROMUS Brahm. Common.
DISTRIBUTION—EAST. ♀ Forth ♀ ♀♀ Moray o o o
WEST. Solway ♀ o o o

PUNCTATO-SULCATUS S. Common.
DISTRIBUTION—EAST. ♀ Forth Tay ♀♀ ♀♀ o o
WEST. Solway ♀♀ o o o

CONTAMINATUS Hbst. Common.
DISTRIBUTION—EAST. ♀ Forth Tay ♀ Moray o o o
WEST. Solway ♀♀ o o o

OBLITERATUS Panz. Rare.
DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. o o o o o

RUFIPES L. Abundant.
DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o
WEST. Solway Clyde o o o

LURIDUS Payk. Common.
DISTRIBUTION—EAST. ♀ Forth ♀♀ ♀♀ Moray o o o
WEST. Solway ♀♀ o o o

DEPRESSUS Kug. Common.
DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀♀
Orkney o
WEST. Solway Clyde ♀♀ ♀♀ ♀♀

HEPTAULACUS Muls.

[SUS Hbst.

"Taken most abundantly by J. Rawlins, Esq., in a field by Ravelston wood, near Edinburgh," Steph. Illust. I think this must be an error. D. S

ÆGIALIA Er.

ARENARIA Fr. Maritime.

DISTRIBUTION—EAST. ♂ Forth ♂ Dee ♂ o o o
WEST. ♂ ♂ o o o

SABULETI Payk. Riparial.

DISTRIBUTION—EAST. ♂ Forth Tay Dee Moray o o o
WEST. Solway ♂ o o o

PSAMMODIUS Er.

SULCICOLLIS Ill. Extremely local.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o o

This is a maritime species, but occurs in a sandy place on the banks of the Tay above Perth. D. S.

GEOTRUPES Er.

STERCORARIUS Har.

DISTRIBUTION—EAST. ♂ o o o o o o o
WEST. Solway o o o o

So much confusion prevails as to *Geotrupes stercorarius* and its allies that I have only been able to record two Scottish species on the authority of a few specimens in my own collection.

FOVEATUS Har.

DISTRIBUTION—EAST. ♂ ♂ Tay Dee ♂ ♂ Orkney ♂
WEST. ♂ ♂ ♂ ♂ ♂

SYLVATICUS Panz. Common.

DISTRIBUTION—EAST. ♂ Forth ♂ Dee Moray o o o
WEST. Solway Clyde ♂ o o

VERNALIS Lin. Rare. Highland.

DISTRIBUTION—EAST. Tweed ♂ ♂ ♂ Moray Sutherland o o
WEST. ♂ Clyde ♂ o o

TROX Er.

SABULOSUS L. Very rare.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o o

SCABER L. Very rare.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

"Jardine Hall." Murray Cat.

SERICA Er.

BRUNNEA L. Not scarce. Lowland.
DISTRIBUTION—EAST. ♀ ♀ Tay Dee Moray o o o
WEST. Solway ♀ o o o

MELOLONTHA Er.

VULGARIS F. Local.
DISTRIBUTION—EAST. ♀ Forth Tay o o o o o
WEST. Solway Clyde Argyle o o

HIPPOCASTANI F. Local.
DISTRIBUTION—EAST. ♀ Forth Tay ♀ Moray o o o
WEST. ♀ Clyde ♀ o o

PHYLLOPERTHA Er.

HORTICOLA L. Common.
DISTRIBUTION—EAST. ♀ Forth ♀ Dee Moray Sutherland o o
WEST. Solway ♀ Argyle o o

ANOMALA Er.

FRISHCII Fab. Rare. ? Maritime.
DISTRIBUTION—EAST. o Forth Tay o o o o o
WEST. o Clyde o o o

CETONIA Er.

AURATA L. Very rare. Lowland.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway Clyde o o o

ÆNEA Gyll. Local. Highland.
DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. o o o o o

TRICHIUS Er.

FASCIATUS L. Local. Highland.
DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. o o o o o

BUPRESTIDÆ.

AGRILUS Kies.

VIRIDIS L. Very rare.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o Argyle o o

(To be continued.)

ZOOLOGY.

GLEN TILT: ITS FAUNA AND FLORA.

By F. BUCHANAN WHITE, M.D., F.L.S.

AN alpine stream for the most part dashing wildly amongst water-worn boulders of all shapes and sizes, but here and there resting awhile in deep, still, black pools; rocky and fern-clad banks rising high on either side, and crowned with a luxuriant and varied growth of trees and underwood; beyond, upland meadows and fields girt with dark masses of pine, or the paler green of the larch and the birch; above all, the brown heather-clad tops of the lower hills: such is the first two or three miles of Glen Tilt.

Then the oak and beech, spruce and sycamore, give way before the graceful birch, and the great wood of Blairuachdar fills up the glen for a mile or two.

Finally the birches disappear and are seen no more, save when, with a few alders, elms, or willows, they clothe the precipitous sides of some tributary burn.

Now the whole aspect of the glen changes. The river, running no longer between high and rocky banks, winds through grassy meadows, which make on either side a haugh of varying width. The sides of the glen sweep upwards in long green slopes almost unbroken, except where the Allt Diridh, the Allt Mhairc, the Allt Cruinnich, or some other stream, dashes through a rocky defile to join the Tilt.

Here and there along the top of the slopes a grey rock lifts on high a serrated crest, and, towering above all, the great domes of Ben-a-Ghlo raise sunwards their mist-swathed summits.

At length the enclosing hills become less steep, and close to the watershed of the Grampians we come upon Loch Tilt—a small mountain lake with no peculiar features of its own—nestling in the bosom of the hills.

The course of the Tilt is about 14½ miles long; but if we

include the Tarff, its chief tributary, which joins it not far from Loch Tilt, we must add another 10 miles. The scenery of the Tarff is quite different from that of the Tilt, being, except at its lowest part, desolate and dreary in the extreme. Where it joins the Tilt its course is a series of alternate cascades and pools, but further up it winds through flat moors encircled by rounded mountain-masses.

A little higher up than Pool Tarff (the junction of the Tilt and Tarff) the Tilt has another large influent in the Lochain, which flows from Loch Loch on the south of Ben-a-Ghlo. Further down the glen it has many tributaries, but mostly of small size, with the exception of three or four, which, with their glens, join Glen Tilt on its northern side.

In altitude above sea-level, Glen Tilt itself varies from 400 to 2000 feet, the surrounding mountains attaining frequently a height of 3000, and in some cases of nearly 3700 feet. Immediately to the north of Glen Tilt lies the Forest of Athole; while the south side of the glen, though frequently invaded by the red deer, affords grazing to many sheep. Much has been said and written for and against deer-forests; but as a zoologist and botanist—and it is in that capacity only that the subject can be considered in these pages—I am strongly of opinion that deer-forests have been very beneficial in preserving both animals and plants which would long ago have vanished had the ground been closely grazed by sheep. Glen Tilt affords a good example of this. The northern, or forest side, is most richly clothed with a luxuriant carpet of wild flowers, and teems with insect life; on the other hand, the south, or sheep-grazed side, is covered with scarcely any plants but grass and fern, save where steep rocks offer a resting-place beyond the reach of the sheep; and in harmony with this lack of variety in the vegetation, scarcely an insect is to be seen. Glen Bruar, which runs parallel to Glen Tilt, and is grazed by sheep, presents a similar case. No doubt there are other causes at work, but I believe it is chiefly owing to its being deer-forest that one side of Glen Tilt is so much richer than the other.

Geologically Glen Tilt is very interesting ground, but it would require a great deal more space than we can afford even to treat very cursorily of its features. For the purposes of this paper it will be enough to say that the formation is the Lower Silurian, and that the rocks are chiefly of a gneissose or quartzose character, and of a kind that do not weather much, and therefore are

not so rich botanically as those which decompose more readily. Here and there are great masses of limestone, which afford an appropriate habitat for some of the lime-loving plants. In other places the hills are largely composed of granite and other intrusive rocks—as, for example, the great mountain called Ben Dearg (or the red hill), which derives its name from the red granite of which it is composed.

At Marble Lodge, about four miles up the glen, the limestone is of a fine, hard, crystalline character, white beautifully veined with greenish in colour, and as it takes a good polish, has been used, under the name of Glen Tilt marble, for mantelpieces, &c. Still further up the valley, where Dal-an-eas bridge crosses the river, this marble limestone again appears, its veins being intermingled with granite and other rocks in a very curious and interesting manner.

The following rambling notes on the zoology and botany of the glen are the combined results of the explorations of several observers, but chiefly of Sir T. Moncreiffe, Mr W. Herd, and myself, though it is by the two first named that most of our knowledge of the Lepidoptera of the glen—the most interesting portion of its fauna—has been acquired. It may also be as well to state that many of these observations were either made or corroborated during a visit that we paid to Glen Tilt in July last, when, by the kindness of the Duke of Athole, our headquarters were at Forest Lodge, and free permission granted to carry on our explorations.

Forest Lodge is a shooting-lodge situated about the middle of the glen, and hence admirably adapted as a centre from which to work. The lodge stands on the north bank of the Tilt, on a long narrow piece of natural meadow, from which the hills rise steeply on either side. On the south of the Tilt the hill rises in a very steep green bank for about 600 feet, where it is surmounted by a high limestone rock—Craig Mhòr—above which, again, is one of the tops of Ben-a-Ghlo. On the opposite side of the valley, also, the hill rises steeply for about 600 feet, but instead of the uniform grassy slope of the south side there is considerable variety of vegetation, amongst which the rock-rose (*Helianthemum vulgare*) holds a conspicuous place. Above 600 feet the slope is less inclined, and heather and blaeberry clothe the surface. Finally, at about 2000 to 2400 feet the summit of the ridge separating Glen Tilt from Glen Cruinnich is reached, which, being followed, leads upwards to a peak about 3000 feet in height. Round about the lodge there is a young plantation of pines and firs, and a few

other trees of older growth, while on the meadow ground and banks of the river there is a luxuriant carpet of low plants.

It must be confessed that at first the scenery near Forest Lodge does not convey the impression that a longer acquaintance with it does. When that has taken place, the quiet pastoral character of the view imperceptibly wins upon the mind, and after a few days have been spent in the silence of the glen, and when, by much hard but well-spent labour, the really large scale on which these apparently low green hills bounding the valley are constructed has been discovered, Glen Tilt will be found to have a charm almost peculiarly its own.

VERTEBRATA.

Of the mammals of the glen there is not very much to say, as they are numerous rather in specimens than species.

At no very distant period it might have been possible, perhaps, had the 'Scottish Naturalist' been then existent, to have described the habits and appearance of the Wolves that then inhabited Glen Tilt, the pits in which the hunters lay in watch for them being still traceable. Now, the chief mammal of the glen is the Red Deer, which, as being the largest remaining land animal still remaining native to Britain, must always possess some interest for a naturalist. Moreover, when one lives in a forest the Deer and their manners and customs are constantly coming to the surface of conversation, and many an interesting fact can be picked up by an attentive listener.

In the middle of summer the Deer do not come much into the glen itself, as food is abundant in the higher glens; but owing to the cold inclement nature of last summer they came frequently into Glen Tilt, close to Forest Lodge, even late in July. It was no unfrequent sight to see, in the gloaming of the evening, many of them on the ridge above the lodge, their graceful forms clearly defined on the sky-line.

Deer often come a long way to a favourite feeding-ground; some of the old harts, which rest on the higher tops during the day, especially when the flies are troublesome, descending to their pastures at nightfall, and returning at daybreak to the hill-tops, perhaps several miles away.

The size that Deer and their horns attain is, as might be expected, much influenced by the quantity and quality of their food. Hence it is that many of the stags which inhabit the forests of Central Europe attain a larger size, and have much bigger "heads," than

the Deer of the Scottish Highlands. In fact, in winter the Deer have to descend to the low country for food, and if they have the chance, commit depredations upon fields of turnips not intended for them. They have generally an allowance of turnips and hay provided specially for them; and without this, and if they were entirely dependent upon their natural food, it is very probable that the stock of Deer in this country would rapidly diminish.

The late Duke of Athole made some experiments on the horn-producing power of certain kinds of food. A young stag was selected and kept in an enclosed field and fed well, powdered deer-horns being mixed with his food. His antlers, as they were shed each year, were carefully preserved, and now form a most interesting and instructive illustration of the progressive annual development of the horns, as well as what judicious feeding can produce. "Tilt," as he was called, at last became too dangerously playful to keep any longer, and he now, as well as all his horns, is preserved in Blair Castle.

The horns that the Red Deer annually shed are generally eaten by themselves or others; even the hinds, who have no horns to grow, taking what they can get, and not always waiting for cast horns, as the following fact observed by Sir T. Moncreiffe, shows. I give it in his own words. "I have myself seen a hind nibbling the top of a live stag's horns, whilst he dozed away with closed eyes, apparently quite enjoying the proceeding. I stalked him, and shot him there and then, and found the tops of his antlers eaten down to where they branch from the main horn."

In the hot weather the Deer are much troubled by the flies, and to avoid them lie on the highest tops. They are also subject to the attacks of a kind of bot-fly, as James M'Donald, the observant and obliging keeper at Forest Lodge, to whom we were indebted for much interesting information, told us. The maggots of this fly live just below the skin of the Deer, and when full-grown come through the skin, and falling to the ground, then change to pupæ. The hide of a Deer that has been thus infested retains the marks of the ulcers always. Not having seen the insect, I cannot refer it to its proper species, but suppose that it is *Œstrus* (or *Hypoderma*) *elaphi*, Schrk, which seems to be the same as *H. Actæon*, Brauer.

The Red Deer has another dipterous parasite, in the shape of *Leptotena cervi* L., one of that curious parasitic family, the *Hipposboscidæ*, which include the spider-flies, and various other sheep, bird, and bee parasites. The one in question does not

confine its attention to the Red Deer, but lives amongst the hair of other species, as the Roe and Fallow Deer.

Deer are very cunning, and many stories might be told of their various dodges, either to escape when pursued, or to get at food protected from them. The wood Deer (that is, those which live in the woods all the year round, and do not take to the bare hills) are much more cunning than the hill Deer, and differ from the latter in several respects.

The other wild mammals of Glen Tilt are few and unimportant, and need not detain us. I do not know whether the Wild Cat is yet to be found there. Though never abundant, it still remains in a few places, especially to the north of the Grampians.

Birds, as might be expected, are not, as a rule, abundant in the upper part of the glen. The Golden Eagle may sometimes be seen soaring over Ben-a-Ghlo, and probably nests in or near the forest. The beautiful Peregrine Falcon breeds in the forest; and, of course, Grouse and Ptarmigan are not uncommon.

The most noteworthy ornithological fact, however, is the occurrence of a large colony of the House Martin on a rock-face not far from Pool Tarff, and miles away from any house. Over a considerable part of the rock the nests are plastered thickly, and to see on a bright morning the feathered multitude flying to and fro in front of their dwellings is a very pretty sight. A considerable number of Rooks and Jackdaws come far up the glen and hunt about the hillsides all day, returning to the lower country about Blair in the evening. At the time we were there in July, they were engaged in picking up caterpillars, I fancy—especially those of the sometimes destructive *Charæas graminis*. Many of these caterpillars had retired under the moss on the top of stones to change into chrysalises, and the Rooks apparently knew this, as the moss was frequently all ploughed up with their beaks. In places where *Empetrum nigrum* is common, the Rooks resort to the hillsides to feed on the berries, which probably derive their name of Crow-berries from this reason. Wood-pigeons, also, frequently come up Glen Tilt to feed upon the wild berries of various kinds—such as blaeberries. In speaking of the Golden Eagle, I forgot to mention that Sir T. Moncreiffe pointed out a dead tree on the ridge near Marble Lodge, on which he once saw no less than five eagles all perched together at one time.

The other vertebrates of Glen Tilt are few in number. Of course the common Frog is not rare upon the hills, always appear-

ing to be going up and never down, while occasionally a Lizard (*Zootoca vivipara*) may be seen on the hillside. It is rather curious that this Lizard should, in north Scotland, be more frequently seen on the mountains than on the lower ground, which, considering that farther south (for example, in the south-west of of Scotland), it is much more abundant, and that from its habits it seems to be a creature that enjoys warmth, would seem a more congenial habitat. It is true that throughout Europe it seems almost confined to hilly countries, ascending to even 10,000 feet on the Alps; but still there seems something curious in its local distribution in north Scotland. I do not think that this peculiarity is by any means confined to the Lizard, for there is more than one insect which, though a little farther south common in the low country, in north Scotland is not common, or does not even occur at all, except on or near the hills. To those who have studied insects in England, Lowland Scotland, and the Highlands, instances of this will at once suggest themselves.

INSECTS.

In noticing the insects of Glen Tilt, I will confine myself, on the present occasion, almost entirely to the Lepidoptera, for the very satisfactory (or rather unsatisfactory) reason, that, of the other orders, I know very little of the species that inhabit the glen. It seems, however, probable, that they are not nearly so well represented as the Lepidoptera. One thing is certain, and that is, that not very much attention has been paid to any of the Glen Tilt insects except the Lepidoptera.

There can be no doubt but that the glen is remarkably rich in the last-mentioned order, and this is the more curious, because, except in the lower part, it is almost destitute of trees, and the accompanying sylvan vegetation. One summer it happened that I spent a few days in the neighbouring Glen Bruar, and then crossed the hills to Glen Tilt. In Glen Bruar—a heather-clad, sheep-grazed country—scarcely an insect was to be seen; in Glen Tilt what a different state of matters was presented! One day last August I walked down Glen Tilt, and I think that I never saw so many butterflies at once before. They were all of one kind, the dark brown *Erebia Æthiops* (*Blandina*), a northern species and rather local. For several miles, turn which way one liked, there was always to be seen a multitude of these butterflies flitting about over the grass. At first I was much interested, soon I loathed the very sight of them. The monotony of seeing

these brown butterflies zigzagging to and fro in every direction became, as it were, a dreadful nightmare; and even yet, by an effort of the imagination, I can recall the feeling of dizziness that the constant pendulous motion of the insects produced. The other butterflies of the glen are about ten or eleven; not a large number, but still just what might be expected. The rarest is *Erebia epiphron*, the only truly mountain butterfly that we have in Britain. This has been found in several places in the glen, ranging from 1500 to 2000 feet; but hitherto only in small numbers. About 1500 feet seems to be the lowest altitude at which it dwells; but once in Rannoch I found a specimen as low as 700 feet. As, however, a lot of sheep had been driven off the higher ground the previous day, I imagine that the butterfly had got entangled in the wool on some sheep's back and been brought to the lower level involuntarily. The other butterflies that have been noticed in the glen are *Cœnonympha Pamphilus*, *C. Davus*, *Pieris brassicæ*, a stray specimen from the cultivated ground wandering, as is often the habit of the species, over the moors in search of fresh fields and pastures new; *Argynnis Aglaia*, *A. selene*, *Vanessa urticæ*, which seems to follow its food-plant, the nettle, wherever it goes, and that is wherever man sets up a habitation. Far away up the glen of the Tarff there is, in the very heart of the hills, a small house known as the Tarff bothy, and inhabited only for a month or so in the deer-stalking season. No proper road leads to it, and I daresay there are few more lonely and desolate habitations anywhere in Britain. Yet here, at an altitude of 1800 feet, there was, in July last, more than one specimen of *Vanessa urticæ* lying dead in the window, and outside, sure enough, was a patch of nettles. *Lycæna Icarus* and *L. Artaxerxes*—which, as its food-plant, *Helianthemum*, is common, is likewise abundant—complete the list of butterflies.

In noticing some of the moths of Glen Tilt I should premise that when "in the woods" is given as the habitat, the lower part of the glen is meant. Most of the species to be mentioned, however, occur close to Forest Lodge, a large majority of them, including even such alpine species as *Psodos coracina*, having been taken within very little more than half a mile from the house. That the valley between Blair-Athole and Forest Lodge is tolerably rich in species may be gathered from the fact, that on the 18th of last July, not by any means a particularly good day for collecting, upwards of 80 species of Lepidoptera were noticed in the ten miles' walk.

Hepialus velleda, with its var. *gallicus* and intermediate forms, is very common about Forest Lodge, where no bracken grows, so that the larva must feed on other roots. I found a specimen as high up as 1800 feet, near Falar. Not far from Forest Lodge also I found a cocoon of *Dicranura vinula* upon a stone—rather a curious situation for a larva which almost invariably uses gnawed bark or wood in the construction of its cocoon. In this case lichens had been used in place of bark. The moth emerged in due season, but did not present any peculiar features. On the hills, the mountain form of *Nemeophila plantaginis*, in which the yellow colour is replaced by white, occurs, but rarely.

A good many Noctuæ inhabit the glen, but, with one or two exceptions, most of them are species of wide distribution in the Highlands. Amongst those less common may be noticed *Acronycta euphorbiæ* var. *montivaga* (see note on another page). The dark half-unicolorous varieties of *Xylophasia rurea* are commoner here than I have seen elsewhere; while of the rare and interesting *Crymodes exulis*, Sir T. Moncreiffe and Mr Herd have each taken a specimen. Nearly as rare (but in Glen Tilt, as far as captures go, much rarer) is *Pachnobia hyperborea*, of which the first British specimen was taken on Ben-a-Ghlo by Mr Douglas many years ago. One chief object of our visit to Glen Tilt last summer was to try and find this species; but the weather was so unpropitious the whole time that we never had a chance of properly looking for it. This moth lives very high up on the top of the hills; and the only trace we saw of it—if trace it was—was an empty pupa-case which I found in the moss about 3000 feet up. *Plusia interrogationis*, which occurs here and there, and *Anarta cordigera*, which we have only seen in one spot as yet, complete the list of the more interesting Noctuæ.

Geometræ are also fairly represented, and include rather a curious combination of mountain and northern species with those which, in Britain at least, are usually considered to be southern rather than northern insects. For example, the occurrence of *Anticlea sinuata*, *Melanippe galiata*, *Psodos coracina*, *Dasydia obfuscata*, *Larentia flavicinctata*, within half or three-quarters of a mile, is certainly a noteworthy fact, when it is remembered that the headquarters in Britain of *A. sinuata* is the low country round Cambridge. In Glen Tilt it would be quite possible to capture it and the northern *Coremia munitata* with one swoop of the net.

In the woods *Venusia cambrica* is not scarce. The two

northern species of *Larentia—caesiata* and *salicata*—abound on the hills; but *flavicinctata* is scarcer, and more local, though found in the woods as low as 500 or 600 feet. *Emmelesia ericetata* may fairly be called common, and goes up as high as 2200 feet; while a single specimen (rather peculiar in its markings) of *E. blandiata*, which occurs here and there in the glen, was taken by Mr Herd at an altitude of 2400 feet. I think, however, that it does not usually live so high up. Of that interesting genus *Eupithecia*, several noteworthy species occur. *E. constrictata* has been taken sparingly at rest on rocks, with the commoner *E. pulchellata*. The form of *E. satyrata* known as *callunata* is of course common. (Mr Harpur Crewe has, I believe, proved that *callunata* is only a northern form of *satyrata*.) In the woods near Blair, the larva of *E. togata* has been found in spruce cones. *Coremia munitata* is very common in the upper part of the glen, where also a curious variety of *C. ferrugata* was taken in July last by Sir T. Moncreiffe (2 specimens) and Mr Herd (1). This insect puzzled us immensely; and we at last concluded that it was a new species. Dr Staudinger of Dresden tells us, however, that it is clearly only a form of *ferrugata*, and that he has similar forms from the mountains of N. Italy and Sweden. It is certainly very different in appearance both from the usual Scottish form, and from the very different English form of this variable insect. *Fidonia carbonaria* ought to occur in several places, but as yet we have only found it in one, and, as usual, amongst *Arctostaphylos uva-ursi*. *Psodos coracina* inhabits most of the higher tops, generally where *Azalea procumbens* grows; and in the glen *Dasydia obfuscata* has been found in several places. *Melanippe galiata*, though not a rare species in Britain, yet is one whose occurrence in Glen Tilt is rather curious. It is not found, I think, in Lowland Perthshire, and in fact is in Britain commoner on the sea-coast than elsewhere, though not a maritime species. Out of Britain, its distribution is in Central and Southern Europe. In Glen Tilt I have seen it at 1400 feet at rest on the same stone with the northern *Larentia caesiata* and *Emmelesia ericetata*. It also occurs in Rannoch.

In the woods the handsome *Geometra papilionaria* is sometimes met with, and wherever larch has been planted *Boarmia crepuscularia* may be found. On the boles of the birches in spring *Lobophora lobulata* may be frequently seen at rest; and on white poplar *L. hexapterata*, but more rarely.

(*To be continued.*)

THE LEPIDOPTERA OF MONCREIFFE HILL.[1]

By Sir THOMAS MONCREIFFE, Bart.

(*Continued from page* 152).

Geometrina.

Venilia macularia.—Common, particularly among wood sage, at an elevation of 600 feet. Varies considerably in the distribution of the brown markings. I have one specimen which has an entire brown band across the middle of the fore-wings, and which is only once interrupted in the hind-wings. I fancy that the upper wings of the male are of a lighter shade of yellow than the under.

Ellopia fasciaria.—Frequent on pine-trunks from 500 feet upwards.

Selenia illunaria.—Locally common some seasons. To be taken flying at dusk—and with a lantern, among whitethorn, after dark.

Odontopera bidentata.—This is a most abundant species, and varies a good deal in intensity of colour, some specimens being excessively dark. I have one bred specimen, a great portion of all four wings of which is quite transparent, looking, at first sight, as if the scales had been rubbed off, but on close examination with a lens it appears to be quite perfect. Comes freely to light.

Crocallis elinguaria.—Not common, but appears to be generally distributed.

Himera pennaria.—Local. The males come commonly to light in the house; the females are less frequent. I have not been able to discover its breeding quarters here, for the same reason, probably, that the larvæ of most of the oak feeders are difficult to obtain—viz., there being no copse or young oakwoods.

Phigalia pilosaria.—Common, and generally distributed at all elevations. Varies considerably in size and depth of shade. Comes freely to light. I have taken this insect here soon after the New Year. Some seasons it flies pretty freely about *Cupressus* in my shrubbery on the bright, still, moonlight nights.

Amphidasis betularia.—Fairly common some seasons, but never plentiful. We have occasional dark varieties, but not so dark as they appear to be in some places. I reared an imperfect female

[1] At pages 147 and 151, No. 144, for "*Tethea retusa*" read "*Tethea subtusa.*"—T. M.

on one occasion, and as I had no time for breeding, I placed her on a tree-trunk near where I had seen the species flying on the previous night. I passed the place in the evening and she was still there. On returning home with my lantern a few hours later, I found her in the embrace of a large slug, which was making a hearty meal. He seemed to be holding on "astarn" to the lichen on the trunk, clasping the moth in his arms as it were. His horns were drawn in and I could hardly make out where his head had got to, but it appeared to be buried in the thorax between the head and the fore-legs of his prey. I poked him up in all sorts of ways, but he did not take the slightest notice by moving in any way.

Cleora lichenaria.—Common. Comes freely to light. The larva appears here to prefer the lichen on the oak to that on any other tree.

Boarmia repandata.—Common, and generally distributed; varies considerably in size and shade, so much so, that sometimes one can hardly believe the large, dark, richly-marked insect to be the same as the small, insignificant, light-coloured one. We have nothing approaching to the banded variety.

Gnophos obscurata.—Common on the rocky faces in the higher altitudes; sometimes wanders down to light in the house. I have never seen a light-coloured specimen.

Dasydia obfuscata.—Locally common, and never appears to quit the rocky faces on which it breeds and loves to rest. Varies considerably in intensity of grey, but the males usually appear to be the darkest. I have seen specimens which I believed at the time to be worn, and left undisturbed. I have since come to think, however, that they were perfect, but inclined to albinoism.

Geometra papilionaria.—This beautiful geometer is fairly common at Moncreiffe, from 30 feet up to 600 in certain localities. The larvæ may be obtained on birch, willow, and alder by beating. The imago I have found at rest on the heather under birch-trees; and in 1872 and 1873 it came frequently to light in my study. Exposure to the light very soon causes the green to fade into yellow; but I have specimens, taken six years ago, killed in a cyanide bottle, dried on the boards in a dark but not very close cupboard, which are as fresh as ever in my cabinet, where they are placed with a moderate amount of camphor. I find it is a good plan to open the drawers occasionally and give insects a little air, and have known instances of moths which were showing grease become quite clean in an hour's time, the

grease having all evaporated. This happened in the case of geometers where the grease was spreading through the wings. When the body is fairly attacked, especially in the thick-bodied insects, I always have recourse to benzin and French chalk, which soon cures them, if carefully brushed off with a camel's-hair brush when dry.

Ephyra pendularia.—This beautiful and delicate-looking insect is to be met with every season, but not commonly. I have usually taken it at rest on the boles of birch-trees, sometimes on the herbage beneath.

Venusia cambrica.—Rare. I only know of one specimen of this insect being taken at Moncreiffe. This was at an elevation of nearly 600 feet, and was a perfectly fresh specimen. I hunted the place carefully for some time afterwards but never saw another.

Acidalia scutulata.—Common locally. These small *Acidalia* are very liable to be overlooked, as we meet with them usually during the evening flight, when no number of hands and eyes are sufficient for the occasion; and I have no doubt several of the species are passed over as *bisetata*, which is a perfect pest.

A. incanaria.—Frequent; and usually if one waits patiently after capturing one specimen, more will follow in the same line of flight. Indeed, this is a good general maxim when watching the evening flight for almost any lepidopterous insect.

A. aversata.—Common and generally distributed. This moth varies very much both in size and shades of colour. Those which I take at an elevation of about 600 feet, and which I usually beat out of the birches, being much less tawny than those I capture among the rough stuff on the open bank by the river-side, at an elevation of 30 feet.

A. inornata.—Not so common as the preceding, but probably often overlooked. I have usually beat it off birch.

Timandra amataria.—Rare. I only know of one specimen occurring at Moncreiffe, which was taken flying in the evening at the back of an old thorn-hedge (bulfinch) in 1872.

Cabera exanthemaria.—Frequent, local. I have one specimen in which the first and second lines seem to be amalgamated into one dark smoky band, which is continued as intensely, but more narrowly, across the posterior wings, giving the insect a peculiar appearance.

Macaria liturata.—Frequent among the Scots firs near the top.

Phasiane petraria.—This is another curious instance of the

appearance of an insect. The first notice of *petraria* at Moncreiffe was in May 1871, when I found it moderately plentiful in *one* bed of bracken at the foot of the hill. Since that time it has gradually spread over the whole place, high and low, wherever the bracken grows. Had it been here before, it could not well have been overlooked by Mr Herd, who has collected here for many years. The best way to obtain good specimens is to collect them at night with a lantern, whilst sitting on the last year's broken-down bracken, or clinging to the grass, &c., as they sit perfectly quiet with their wings spread, and the markings show very distinctly by lamplight.

Fidonia atomaria.—Locally common. I have a pretty variety of the female, in which the first line forms an eye at the base of each fore-wing looking like a pair of spectacles. I am not aware whether this variety is common or not.

F. piniaria.—This is a very common insect among Scots firs. The males do not appear to vary, the ground colour, as far as I have observed, being invariably white. The females, however, are excessively variable. Some are orange-brown with more or less of the ordinary brown markings, others are marked like the male, only that the lighter area is yellow instead of white, and the black-brown in the male is in the female brown with a slightly orange tint. In another specimen in my cabinet, the dark markings are almost as dark as in the male, but the remainder and larger area is smoky-grey brown. They vary also in expanse of the fore-wings from 1 inch 4 lines to 1 inch 6 lines.

Abraxas grossulariata.—I am thankful to say that I have not seen this insect at Moncreiffe for many years, although I remember seeing it in the garden in plenty when I was a boy. It has, however, occurred since that time in some of the cottage gardens.

Hybernia rupicapraria.—Common on all thorn-hedges. Appears about the New Year; indeed in forward seasons it is a question whether it is the last moth of the old year or the first of the new. Mr Herd has taken them on the wing *in copula;* and I have no doubt that in this way the geometers with small apterous females are distributed about the country, as otherwise they would naturally be confined to the locality in which they were bred, from the absence of the power of locomotion which is given to winged females.

H. leucophearia.—This is a common insect, and seems particularly attached to the sycamore. It varies considerably in mark-

ings. I have one or two pretty varieties. I once took a female on the wall of my house; a shabby trick of the male probably, as there was no tree near from which she could have been blown, unless she had got a ride on a leaf.

H. progemmaria.—This is another insect which is to be met with frequently on moonlight nights in spring, flying about *Cupressus* in my shrubbery—indeed the members of the *Hybernia* family seem to be a hardy lot, as most of them fly at night during hard frost.

H. defoliaria.—Frequent, but local; comes to sugar. A proof of the amount of cold which this insect can endure, once came under my notice. About 11 A.M. on the 6th December 1871, I was crossing the ice which covered a pretty large pool of water to the depth of three or four inches. The white hoar-frost lay all over, and so heavily had it fallen, that the leaves and small branches which lay on the surface looked half an inch thick. The trees around were covered with it, and the whole scene was one of bitter cold mid-winter. A form on the ice attracted my attention, from its shape looking like a large white butterfly. I removed the hoar-frost and there, with outstretched wings, lay a specimen of *H. defoliaria.* It appeared to be dead, and although the frost lay thickly upon it, it was not adhering to the ice on which it lay. I took it up and placed it on a shelf in the wooden house where our curling-stones are kept. On entering some hours after, I found my friend on the window quite lively. Now this insect must have been a good many hours in the position in which I found it, as the hoar-frost must have fallen at latest about daylight, and most probably some hours earlier.

Cheimatobia brumata.—Common in the garden at Moncreiffe, particularly on gean (wild cherry) trees. I do not observe that it is distributed through the woods as it is in some parts. I do not find it here atttached to the oak and other forest trees in the plantations.

C. boreata.—Frequent, and I think more generally distributed here than *brumata*, but certainly not so abundant where it does occur.

Oporabia dilutata.—I am very much puzzled with this common species. I have taken specimens from the 1st of September till the end of November, which by the description may be *dilutata*, *autumnaria*, or *filigrammaria.* Newman gives *dilutata* as appearing in November, and being of larger size than *filigrammaria;* whereas the largest, most glossy specimens which I take here are

to be met with in September and October. He ignores *autumnaria* altogether. Both Mr Stainton and Newman agree in stating that the larva of *dilutata* is a general feeder on forest-trees, but Mr Stainton gives September and October as the months for taking the imago. He also says the larva of *filigrammaria* feeds upon heather. Newman (quoting Mr Hellins) says sallow. Wood's fig. 639 (erroneously quoted 693 by Dr Staudinger in his Catalogue) is somewhat like the later and less glossy specimens I take here; but his figure in the Supplement—1727—which is not quoted by Dr Staudinger at all that I can see, is a fac-simile of some of the early glossy ones. Hubner's figure, 188, is like a specimen I possess, which I took on the 29th of September among glossy bluish-grey ones, and is of the green-grey type. Dr Staudinger places a ? before "*filigrammaria*;" and although Herrich Schäffer's figures, 194 and 195, are those of a smaller insect, he himself says, "It is perhaps only a small sharply-marked variety of *dilutaria*." On the whole, until it is *proved* to the contrary, I shall hold to the belief that "*dilutata*," "*autumnaria*," and "*filigrammaria*" are one and the same species.

Since the above was written, Dr Buchanan White's investigations have made it perfectly clear that *autumnaria* and *dilutata* are quite distinct, and probably *filigrammaria* also.

Larentia didymata.—A perfect pest. I remember on one occasion boxing a female, and my coat over the pocket was very soon pretty nearly covered with males trying to find out where she had got to.

L. multistrigaria.—Common. In certain localities any number may be taken at night with a lantern.

L. cæsiata.—Common in the woods among *Vaccinium myrtillus;* varies considerably in shade, some specimens being very dark indeed, and might almost be taken for a different insect.

Emmelesia alchemillata.—Common in some localities. I am not aware that any species of *Galeopsis* grows commonly where I find this insect in most profusion.

E. albulata.—This insect has of late years appeared commonly among the "natural hay" near my house. It had not been observed here previous to 1872.

E. decolorata was also first observed here in 1872, in one locality only, since which I have seen it pretty commonly wherever the campion grows.

E. crieetata.—I took one specimen on Moncreiffe Hill in

August 1872. I am not aware that it has been otherwise observed here.

Eupithecia pulchellata.—Common some seasons near the food-plant. Most of my specimens were taken at rest on, or disturbed from, rocks or stones near beds of foxglove, at an altitude of 600 feet and upwards. Some specimens are dark and very richly marked

E. centaureata.—Not common, but fairly distributed. I have taken it at night on wood-sage blossom; and Mr Herd tells me he has found it at rest on thistle and ragweed stems in the daytime.

E. subfulvata.—Not common. I have one very beautifully-marked specimen, which Mr Guenèe considers to be the variety *oxydata*. The late Mr Doubleday's opinion (see 'Scottish Naturalist,' vol. iii. p. 266) was at variance with Mr Guenèe's; and if two such authorities differ, the less I say the better.

E. pygmæata.—Rare, though not uncommon in close proximity.

E. satyrata.—Frequent at all times. Sometimes common. The var. *callunaria* of Mr Stainton occurs most frequently; but I have taken specimens which approach very closely to the English type in the same locality.

E. castigata.—Common and generally distributed. This genus is so difficult to determine that it is impossible to be always quite certain as to the identity of wild specimens. *Castigata* and *lariciata* are so closely allied that it is quite possible there may be a third species here mixed up with them. I do not in any way assert this to be the fact, but I confess to a difficulty in separating all I take.

E. lariciata.—This is a most variable species here, as mentioned above. Some freshly-emerged imagos have a most beautiful rosy patch in the centre of the fore-wings, making them appear as distinct from "*lariciata*," as that insect is from "*subfulvata*." But, alas! after a time it fades away, and in a few months leaves little or no trace behind. Mr Harpur Crewe, however, to whom I submitted most of my specimens for examination, does not appear to have the same difficulty in identifying them, so I "cave in."

E. indigata.—A very common insect amongst Scots fir. It is disappointing that *E. fraxinata* has not turned up here, as the food-plant (ash) is a perfect weed.

E. nanata.—Fairly common. All the specimens I have seen

from here are fine and clearly marked, but I have seen no dark varieties such as occur in Rannoch and Glen Tilt.

E. minutata.—I do not feel quite clear in my own mind about the identity of this *Eupithecia* here. I have a specimen taken in Blair-Athole which coincides most distinctly with Hubner's figure 454 of *minutata*. What I take here and separate from *absynthiata* as *minutata* differs principally in size, whereas in my Blair-Athole specimen there is a most decided difference, to my eye, in the whole insect.

E. assimilata.—Frequent among currant-bushes, and appears early in May. I now find no difficulty in distinguishing this insect from its congeners; both the shape of the wing and the subterminal markings are quite distinct.

E. tenuiata.—Common among sallows and willows. Although this is a very backward season (1877), Mr Herd and I saw the larva nearly full fed on the 20th of April, many of the sallows being still only in the white bud.

E. dodoneata.—I took a specimen which may be this insect, but I have my doubts. A better man than me, however, said, "*dodoneata?*" so I give it the benefit of the doubt, as I do not know *dodoneata* myself.

E. abbreviata.—Common and generally distributed. Varies considerably in every way. There is a difference of two or three lines in the expanse of some of my specimens. In some, also, the ground shade of colour is unicolorous grey-green; in others there is a light-coloured area sometimes edged with tawny in the centre of the upper wings. The one constant mark, however, is the perpendicular line-like central spot.

E. sobrinata.—There were not many junipers here for a number of years; but where they were *sobrinata* was to be found. I have lately planted out a few, and the insect appears to follow the food-plant. It strikes me, however, that it feeds upon spruce or some other of the fir tribe, as I have taken it far away from juniper in fresh condition and early in the season.

(*To be continued.*)

Anecdote of the Manx Puffin of the Dardanelles.—There has long been in the Norwich Museum a specimen of this Shearwater, which is so common in the Black Sea and in the Mediterranean. It is stated on the ticket of the case that it was captured by Lieutenant Coppinger of H.M.S. Malabar, "by two flocks in rapid flight meeting each other with such rapid velocity that two (of the Shearwaters), striking each other, fell dead in his boat." The

bird which was obtained in this curious manner is barely separable from the English species. It was presented to the Museum by Bishop Stanley, the father of the present Dean of Westminster. The next collision in the Black Sea will most likely be, not between "feather-clads," but "iron-clads;" and as the British fleet is again ordered to Besika Bay, a British lieutenant may stoop to pick up a Turkish *Mahmoudieh* or a Russian *Popoff*.—J. H. GURNEY, junior, Northrepps Cottage, Norwich, 6th July 1877.

Gynandromorphism in the Honey-bee.—Enclosed I beg to send you an abnormal specimen of the Honey-bee (*Apis mellifica*). You will observe that the two sides of the insect are quite different, the right being that of a worker, and the left that of a drone. The difference will be best seen in the eyes, one of which is much larger than the other; and also in the hind-legs, that on the one side having the pollen-basket of the worker, that on the other being without it. You will also observe the fringe of hairs on the latter segments of the abdomen, as seen on drones.—W. FLETT, Dempster Street, Wick, Aug. 4, 1877. [The specimen—which has unfortunately been destroyed by an accident—had all the peculiarities pointed out by our correspondent.—EDITOR 'Scot. Nat.']

A Deceived Bee.—When standing, one morning last summer, at my dressing-room window, which was open, I noticed a bee making directly for the window. I drove it away, but it persistently returned; so I watched its proceedings. Coming up in "tacks," gradually shortening, it entered the room, and proceeded at once to a cake of strongly-scented soap, which it examined all over; after apparently satisfying itself that it was not a flower though it smelt like one, it flew away.—HORACE SKEETE, Perth, Dec. 1877.

Acronycta Myricæ not a distinct species.—The following extract from a letter received from Dr Staudinger will be interesting to British lepidopterologists: "Thank you kindly for the two specimens of *Acronycta myricæ*, Gn. I received before specimens of this species from England, and saw many there, and I find that they are *quite identical* with the alpine form of *A. euphorbiæ*, named *montivaga*, also by Guenée."—F. BUCHANAN WHITE.

Colias Edusa.—In September last I caught a specimen of *Colias Edusa* here, twenty miles from the sea. Others were seen.—J. M'ANDREW, New Galloway, Oct. 1877.

Sphinx Convolvuli in Fife.—On August 24 I had a ♂ specimen of *Sphinx convolvuli* brought to me, which was taken at Balmuto; and on September 18 a ♀, captured at Newbigging, Burntisland.—J. T. BOSWELL, Balmuto, Fife, 5th Dec. 1877.

Caparcaillie.—Mr J. A. Harvie-Brown, Dunipace House, Larbert, is collecting statistics on the increase and spread of the Caparcaillie in Scotland since its restoration at Taymouth in 1836. Any one interested in the subject, who is willing to impart even a single fact, on application to Mr Harvie-Brown will receive printed forms showing, in a series of queries, the points upon which he specially desires information. He will be greatly obliged for the smallest assistance.

PHYTOLOGY.

ON CERTAIN LICHENS BELONGING TO THE GENUS PARMELIA.

By JAMES STIRTON, M.D., F.L.S.

CONSIDERABLE attention has lately been bestowed on the spermogonia and spermatia of lichens, mainly as a means of discriminating genera and species. The relationship of these organs to the apothecia is far from being satisfactorily determined, inasmuch as direct experiments bearing on the question are awanting; and it is only by way of analogy that a presumption is afforded that they play the same *rôle* as the antheridia of mosses to the archegonia. The constancy in size and configuration of the spermatia in the same lichen is remarkable considering their minuteness, and warrants their importance as a means of diagnosis in critical cases.

Since the publication by Dr Nylander in 1860 of his 'Syn. Meth. Lichenum,' considerable diversity in the form and size of the spermatia in the *Parmeliæ* has been discovered. Indeed, with the exception of two Australian species, all the others were then reckoned to have bifusiform spermatia. This is now known to be far from true. In one instance—viz., *P. perforata*, I am still in doubt whether the European and North American forms (which certainly differ, in outward form at least, from specimens received from the southern hemisphere) have bifusiform spermatia or not, inasmuch as the two specimens at hand are destitute of spermogonia. It is rather curious also, that amongst all the magnificent fruiting specimens received from South Africa, not one spermogonium containing spermatia has been detected. However, from Australia and New Zealand, whose lichen floras possess several remarkable points of resemblance to that of South Africa, I possess specimens bearing spermogonia containing spermatia. In these, the spermatia are exactly cylindrical, and longer than usual. Until this question is definitely settled, any conclusions as to the diversity or identity of the specimens

from the two hemispheres must remain doubtful. Meanwhile, acting under the impression (which Nylander certainly leads one to infer) that the specimens he has seen have bifusiform spermatia, I have separated the plants of the southern hemisphere from those of the northern.

In the estimation of the dimensions of the spermatia, I have been favoured with the improved microscopic appliances in the possession of Mr A. Schulze of Glasgow, including Ross's 1/10 immersion objective, and Powell & Lealand's new formula 1/8, with B and C eye-pieces. They have also been viewed with oculars up to 2000 diameters. Those spermatia designated *cylindrical* do not betray the slightest tendency towards a bifusiform or sublageniform configuration.

It should also be stated that the breadth of each spermatium is only given approximately.

Parmelia reparata sp. nov.—Sat similis *P. perforatæ* sed thallo firmiore et minute reticulato-diffracto sporisque late ellipsoideis, .013-.014 × .009-.011 mm. Spermatia recta exacte cylindrica, .011-.014 (interdum .015) × circ. .0007 mm.

Apud Cave Mountain prope Brisbane in Queensland, a F. M. Bailey lecta, et prope Wellington, N.Z. (J. Buchanan).

In this view of the spermatia of this lichen, *P. Oxaniana*, described in the 'Trans. of the Glasgow Field Nat. Soc.,' published in September of 1877, approaches closely to it.

Parmelia erubescens sp. nov.—Thallus pallide rufescens vel rufescenti-cervinus, laciniato-lobatus, laciniis rotundatis margine crenatis vel crenato-incisis et nigro-ciliatis, subtus totus fuscescens vel spadiceus et breviter sed creberriter nigro-rhizinosus; medulla pallido-albida (K fl. dein rubens); apothecia ignota; spermogonia innata extus nigra spermatiis exacte cylindricis, rectis, .008-.01 × circ. .0005 mm.

Prope Brisbane supra cæteras Parmelias (F. M. Bailey).

Although closely allied to *P. perforata*, the differences as indicated above are quite sufficient to warrant a separation. The colour of the thallus seems normal and not induced, as we see occasionally in *P. perforata*, by extraneous influences. The marginal cilia are much thicker and longer than the rhizinæ, which are finer than usual.

Parmelia amplectens sp. nov.—Thallus pallidus vel albido- aut

pallido-glaucescens, laciniato-divisus adpressulus, laciniis plerumque angustis interdum rotundatis et sæpe sinuato-divisis, subtus niger, ambitu spadiceus vel pallidior, breviter nigro-rhizinosus; medulla pallide rufescens vel rarius obsolete rufescens (K fl. dein intense rubens, I leviter violacea); apothecia fusca vel fusco-rufa mediocria (latit. 2-5 mm.), receptaculo plerumque pallidiore, extus lævigato, margine fere integro et sæpius inflexo; sporæ 8næ ellipsoideæ, .015-.018 × 009-.012 mm.; spermogonia innata vel in verrucis nonnihil prominulis insidentia; spermatia recta cylindrica, circ. .006 × .0007 mm.

Ad ramos apud montes Neilgherries in India a Dr G. Watt lecta.

The reaction by iodine on the medulla is characteristic and constant, although occasionally slowly developed.

Parmelia coilocarpa sp. nov.—Thallus albus vel albidus, interdum ad rufescentem mergens, lævigatus laciniato-lobatus, laciniis margine minute sinuato-divisis, breviusculis, subtus niger creberriter et breviter nigro-rhizinosus; medulla alba (K fl. dein rubens); apothecia elevato-sessilia fusco-rufescentia majuscula (latit. 7-12 mm.), receptaculo extus foveolato-impresso, margine fere integro sæpius incurvo; sporæ 6-8næ, .024-.034 × .012-.017 mm., paraphyses non distinctæ in gel. firma involutæ. Iodo gel. hym. intense cærulescens. Spermatia cylindrica recta, .005-.0058 × .00065-.0008 mm.

Ad ramulos, prope Fernando Po in Africa occid., a G. Thomson lecta.

The spermatia are not so exactly cylindrical as those previously described, but it would be a stretch of imagination to designate them otherwise.

Parmelia xanthotropa sp. nov.—Thallus flavescens vel cinerascenti-flavescens, adpressus vel crustoso-adpressus laciniatus, laciniis brevibus ambitu crenatis vel sinuato-dissectis, nonnihil imbricatis, rugulosus vel nodulosus (saltem centro) vel passim tuberculoso-isidiatus, subtus niger parce rhizinosus; medulla alba (K fl. dein intense rubens vel sanguineus); apothecia fusco-rufa, mediocria (latit. 3-7 mm.), margine receptaculari fere integro et plerumque incurvo; sporæ ellipsoideæ, .018-.026 × .011-.015 mm. Iodo gel. hym. intense cærulescens. Spermogonia nigra, peridio toto infuscato et crassiusculo; spermatia bifusiformia, .006 .007 × (vix) .001 mm.

Saxicola? prope Somerset East in Africa australi, a cl. P. MacOwan lecta.

The specimen is small, and so far the diagnosis of the thallus is imperfect. So abundant is the colouring matter, that the epithallus moistened with K, shows an after purplish-red reaction.

Parmelia testacea sp. nov.—Thallus pallescens vel pallide cinerascens vel etiam pallide cervinus, centro squamulosus vel crustoso-squamulosus, radiato-laciniatus, laciniis sæpius oblongis et lobato-divisis, adpressulus (K fl. dein rubens), subtus niger breviter nigro-rhizinosus; apothecia subconcoloria, testacea vel demum hepatica, sessilia, plana majuscula (latit. 4-20 mm.) rotundata, plerumque lobato-incisa (præsertim seniora), receptaculo extus rugosulo et margine fere integro; sporæ ellipsoideæ, .013-.018 × .0085-.01 mm. Spermatia bifusiformia, .006-.007 × .0007-.0008 mm.

Ad saxa? prope Wellington, N.Z. (J. Buchanan).

(*To be continued.*)

SCOTTISH GALLS.

By J. W. H. TRAIL, M.A., M.B., F.L.S.

(*Continued from page* 170.)

TILIA EUROPÆA L.—A few weeks ago I received from Dr Buchanan White leaves of a lime-tree (apparently *T. grandifolia*, Ehrh.) picked up by him at Dunkeld towards the end of October, on which were numerous nail-galls, the work of a species of gall-mite (*Phytoptus tiliæ*). They are scattered irregularly over the upper surface of the leaf, from which they project at right angles, and are more or less spindle-shaped, tapering slightly towards the base, and considerably towards the apex, which is turned to one side; they may reach $^1/_3 \times {}^1/_{10}$ inch in size, but are usually rather smaller. The surface is smooth or slightly furrowed, pubescent, and is green, yellowish-brown, or red in colour. On section, the gall is found to contain a central elongated cavity, opening on the lower surface of the leaf by a small hole nearly closed with short yellowish hairs, among which the mites live. These galls are common in many parts of

England (*e.g.*, at Kew, where I have seen them in great abundance), and on the Continent, so we may expect them to occur in other localities in Scotland. They are of great historical interest, as being among the earliest described mite-galls. Reaumur describes and figures them in his 'Mémoires pour servir à l'histoire des Insectes' (1737), and tried to discover the maker with the aid of a lens. Turpin, in 1833, ascertained that they were the work of a mite, which he called *Sarcoptes gallarum Tiliæ;* and not long after Dugès traced the development of the galls. They have since been noticed by almost all French and German writers on galls, and the galls themselves received the name of *Ceratoneon extensum* from Bremi.

Galium verum L.—(*e*) Leaf-rolling by a species of gall-mite. It resembles the deformities produced on *Galium aparine* ((*b*) vol. IV., p. 15), and on *G. saxatile* ((*a*) l. c., p. 15); the leaves of the upper whorls have the margins revolute so as to form two tubes, while the leaves become slightly thickened and distorted, and assume a yellowish tinge. The mites live in the interior of the tubes, usually only a few in each. Not uncommon near Old Aberdeen, but readily overlooked, as they are very inconspicuous. In the 'Zeitschrift für die gesammten Naturwissenschaften,' vol. xxxiii. pp. 344-47, and vol. xlix. pp. 361-62, Dr Thomas of Ohrdruf has described these deformities as occurring on the species of *Galium* mentioned above, and also on *G. sylvestre* and on *G. mollugo*, so that we may expect them to occur on these plants also in Scotland.

Betula alba L.—(*f*) Scattered over the blade of the leaf, projecting on both surfaces as conico-cylindrical warts $^1/_{35}$—$^1/_{25}$ inch in diameter; surface naked, smooth, and green or red at first, becoming wrinkled and brown afterwards; walls thin in proportion but woody, opening below by a narrow passage filled with hairs. In the interior live numerous gall-mites (*Phytoptus*, .006 – .007 × .0012 inch). These galls are most readily detected by the shotty feeling when the leaf is pressed between the finger and thumb. As many as 50 may occur on a single leaf. At Banchory-Ternan, 1st September. They are well described by Dr Thomas in the 'Nova acta der Ksl. Leop.-Carol. Deutschen Akademie der Naturforscher,' vol. xxxviii. pp. 266-68, figs. 12-15.

(*g*) The WITCH-KNOTS, so familiar to every one on the birch, resembling rook's nests from a little distance, have been shown by Miss E. A. Ormerod to be the work of gall-mites ('Entomologist,' vol. x. pp. 83-86, April 1877). Dr Thomas (l. c., pp. 257-59, figs. 1-8) has described very fully and figured the earlier stages of the same deformity. Single buds are attacked, and show the effect of the attack by becoming swollen to the size of a pea; the bud-scales become enlarged and covered with a thick coating of silky adpressed hairs; they also stand some distance apart, so that the bud loses the compact form and glossy surface natural to it. On examination with the aid of the microscope, the mites are found in multitudes between the inner scales, chiefly towards the base where the hairs are replaced by spherical papillæ. The affected buds may occur singly, but they usually, after a time, form compact masses an inch or more in diameter, composed of abortive twigs beset with buds each attacked by the mites. After a considerable time (some years) the twigs grow to a greater or less length, but swollen and distorted in form, and form the Witch-knot, sometimes reaching a diameter of two or three feet. The attacks of the mites seem to stimulate the production of woody tissue at the point affected, and to favour the development (in distorted state certainly) of the young buds in the axils of the bud-scales, while hindering the development of the leaves themselves. The *Phytoptus* is of the usual size and form (.0064 × .0012 inch). These galls are common in most localities, and the various stages of development may be well traced in winter while the branches are bare.

ALNUS GLUTINOSA L.—(*c*) *Erineum alneum*, Persoon, is one of the mite-galls formerly looked on as fungi, but now known to be the work of *Phytoptus*. It occurs scattered over the lower surface of the leaf in slight depressions (which correspond to very low elevations of the upper surface) in scattered patches of irregular form, $\frac{1}{6} - \frac{1}{3}$ inch across, between the veins. Sometimes the whole lower surface of the leaf may be covered, sometimes the patches are very few and small. At first yellowish-white, a rusty or red tinge begins to appear round the margins, and soon spreads all over the patch. Under the microscope it is found to consist of vesicles, each supported on a slender stalk, from the top of which it branches irregularly, each lobe ending in a rounded

dilatation or head. Among these filaments live mites of the usual form (.0056 × .0011). Common beside the Dee at Banchory-Ternan; at Perth, &c.

All the above galls are the work of mites of the genus *Phytoptus*, to which all the true gall-mites yet known belong. In Greville's 'Monograph of the Genus Erineum' ('Edinburgh Philosophical Journal,' vol. vi. p. 67 *et seq.*) we find several of the supposed fungi recorded for Scotland, chiefly from Roslin and the neighbourhood of Edinburgh. These are as follows:—

1. *Erineum subulatum*, Grev. (= *E. juglandinum*, Pers.) On leaves of walnut (*Juglans regia*); Braid Hermitage, near Edinburgh.

2. *E. acerinum*, D.C. (Hook., Fl. Scot. II., 34) (= *E. pseudoplatani*, Kunze). On leaves of *Acer pseudoplatanus;* near Roslin, and at Braid Hermitage.

3. *E. tortuosum*, Grev. On leaves of birch (*Betula alba*); Ravelrigg Toll and Bilston Burn, both near Edinburgh.

4. *E. betulæ*, D.C. (= *E. roseum*, Schultz), } on birch, Ravel-
5. *E. betulinum*, Schum. } rigg; *vide supra*, iv. 17 (*c*)

6. *E. alneum*, Pers., on leaves of alder; *vide supra*.

7. *E. oxyacanthæ*, Pers., on leaves of hawthorn (*Crataegus oxyacantha*), at Roslin, &c.

Of these I have not met with Nos. 1, 2, 3, and 7.

In the 'Zoologist,' 1853, pp. 3875-76 (Proceed. of the Berwickshire Naturalists' Club, x. 3), Mr Hardy has noted the occurrence of the following galls, the work of species of *Phytoptus*, in Berwickshire; I use the names that have been given to the galls themselves for convenience of reference:—

1. *Ceratoneon attenuatum*, Bremi, on leaves of *Prunus Padus* (Scot. Nat., i. 124).

2. Similar galls along the midrib of the leaf of *P. spinosa* (referred by Dr Thomas to *Cephaloneon molle*, Bremi).

3. Galls on upper surface of leaf of *Alnus glutinosa*, in axils of chief veins ((*b*) Scot. Nat., i. 194).

4. *Erineum alneum*, on leaves of *Alnus glutinosa*.

5. Galls on leaves of *Betula alba*, like No. 3. (? *Bursifex betulæ*, Amer.)

6. *Bursifex salicis*, Amer., on leaves of *Salix aurita* (*vide* Scot. Nat., ii. 301-2, *sub* (*c*) *S. capreæ* and *sub S. aurita*).

7. *Calycophthora avellanæ*, Amer., on hazel (*Corylus avellana*). (Scot. Nat., iv. 17.)

8. Flower-bud-galls on *Galium verum* (Scot. Nat., i. 156, and (*c*) ii. 80).

9. Leaf-rolling on *G. aparine* (Scot. Nat., (*b*) iv. 15).

10. *Calycophthora serpylli*, Amer., on *Thymus serpyllum* (Scot. Nat., i. 158; ii. 252 (*a*)).

11. Galls on *Polygala vulgaris*, the leaves at the tip of the shoot becoming swollen, distorted, and covered with hairs, with the margins rolled in.

12. Similar galls on *Lotus corniculatus;* and,

13. On *Campanula rotundifolia.*

I have not myself met with Nos. 2, 5, 11, 12, and 13 of the above list.

(*To be continued.*)

Note on Mnium punctatum var. elatum.—In the Report of the last meeting of the Cryptogamic Society of Scotland it is stated that a specimen of "*Mnium punctatum* var. *elatum*," a new British form, recently found by Messrs Rogers and Percival, was exhibited to the members of the Society met at Dunkeld. I have not seen the actual specimen referred to, and consequently cannot, from personal examination of it, affirm that it is not what it has been supposed to be, but I very strongly suspect it is not. The grounds of my suspicion are as follows: In September last I received, through the kindness of Mr Whitehead of Dukinfield, a well-known north of England bryologist, a specimen named *Mnium punctatum* var. *elatum*, gathered in June, by Messrs Rogers and Percival, near Southport. This I suppose to be part of the same gathering to which the specimen exhibited at Dunkeld belongs, but on examination I found it to be quite different from *Mnium punctatum* var. *elatum* in the general appearance, the form of the leaf, the structure of the areolation, the character of the border, and the occasional presence of rudimentary or well-developed teeth. The specimen in my possion certainly belongs to *M. affine*, and it is more than probable that those exhibited at Dunkeld are identical. It may also be well to state that *Mnium punctatum* var. *elatum*, which has a wide geographical distribution in Europe and America, has been known for a number of years as a British plant, and was gathered in Scotland by the late Mr Hunt.—J. Fergusson, The Manse, Fern, Dec. 1877.

[Mr Fergusson is quite right in supposing that the specimen exhibited at the Cryptogamic Society's meeting is part of the same gathering as was sent to him. I have examined the specimen, and find that it exhibits the characters he mentions. —Editor 'Scot. Nat.']

GEOLOGY.

THE GOLD-FIELD AND GOLD-DIGGINGS OF CRAWFORD-LINDSAY (LANARKSHIRE).

By W. LAUDER LINDSAY, M.D., F.R.S.E., F.L.S.

THE auriferous capacity of that portion of the Southern Highlands—that section of the Lowther range of hills—which has frequently been denominated "God's Treasure-House in Scotland,"[1] has recently created renewed interest on the part of our local mineralogists and geologists—and of all, in short, who are concerned in the development of the mineral wealth of our country—in consequence of the presentation to the National Museum of Science and Art at Edinburgh, in March last, of a lump of auriferous quartz, the alleged produce of the district in question. A duplicate of the printed label attached to it in the said museum, for which I am indebted to Dr Grierson of Thornhill, Dumfriesshire, bears the following inscription: "Auriferous quartz found by A. Gemmell, miner, at Wanlockhead, in 1872. This specimen was unfortunately broken up by the finder, and the different pieces came into the possession of his Grace the Duke of Buccleuch, Mr Clark of Speddoch, Mr Dudgeon of Cargen, Dr Grierson, Thornhill, and Mr Stewart, Wanlockhead, who have presented the restored mass to the Museum of Science and Art, Edinburgh." The specimen in question is what I described nearly three years ago in the 'Scottish Naturalist'[2] as the "Gemmell Quartzite."

The auriferous district of Crawford-Lindsay stretches from the

[1] Four of the chief streams of the district, which are hereinafter mentioned, or their tributaries, were in the olden time compared to the four rivers in "the Garden of the Lord," Pison, Gihon, Hiddekel, and Euphrates, which "compass the land where there is gold." Under the title of "God's Treasure-House in Scotland," the district is spoken of both by the Rev. Dr Moir Porteous, in a work afterwards quoted, and by Dr John Brown of Edinburgh, in his pamphlet on "The Enterkin."

[2] Of April 1875.

Clyde between Abington and Elvanfoot to the Nith between Sanquhar and Enterkinfoot. The old capital of the district—the village of Crawford—is on the Clyde between Abington and Elvanfoot, with

"Auld Crawford-Lindsay's towers,"

the remains of the once large and strong castle of Crawford or Crawford-Lindsay, on the opposite side of the river. This little village and old castle give his title to the present chief of the former holders of, and rulers over, all this district—the Earl of Crawford and Balcarres.[1] But what is of more interest in connection with our present subject, the said castle—which is also but less appropriately known as Tower-Lindsay—was the scene of the story that was told by Sir Walter Scott,[2] and has been so often quoted, concerning the presentation to King James V. of the golden "Bonnet Pieces,"[3] as the only, or the finest, fruits of the then, and now, barren-looking moorlands of Crawford-Lindsay.

The auriferous capital of the district is, however, Leadhills, up among the Lowthers, about midway between the Clyde and Nith; and the smaller village of Wanlockhead, which is only a mile distant, may for all practical purposes be regarded as a part of, or offshoot from, Leadhills. These villages are on the watershed between the Clyde and Nith; and hence some of the auriferous streams that traverse the district flow Clydewards, while others flow Nithwards. The most important of the former are the Gonner and Elvan waters or streams—the one emptying itself into the Clyde near Abington, the other at Elvanfoot. Of the Nith tributaries from this part of the Lowthers, the chief are the Mennock and Enterkin; the one, corresponding to the Gonner, opening into the Nith above Sanquhar—the other, corresponding to the Elvan, finding an entrance and exit at Enterkinfoot.

Specially in order to survey its auriferous riches, I have carefully traversed this district twice—in 1863 and again in 1877—taking notes on the spot, not only of what I saw, but also of

[1] In his 'Lives of the Lindsays' (London, 1849, p. 22) this nobleman, who was then Lord Lindsay, described the auriferous, argentiferous, and plumbiferous possessions of the Lindsays in the Barony of Friemuir or Crawfordmuir in 1239, when gold was systematically mined, especially in the Elvan valley, as "the Gold Scours" of the present day so far testify.

[2] In his 'Tales of a Landlord.'

[3] For a short description of these coins, see the article entitled "Bonnet Pieces" in Chambers's Encyclopædia.

what I heard; for I made a point of seeing all the leading local residents who could give me information concerning gold-finding in the Lowthers in modern times. Specially are my acknowledgments due to the following residents of different parts of the district for the information which they kindly placed at my disposal, in some cases by writing as well as orally, or by letter instead of by word of mouth :—

I. Leadhills—

(1.) The late Mr Gill, factor to the Earl of Hopetoun.
(2.) The late Mr James Noble, innkeeper.

II. Wanlockhead—

(1.) The Rev. Dr Moir Porteous; the author of the most recent topographical account of the district and its products.
(2.) Dr Wilson.
(3.) Mr Robert Laidlaw;
(4.) Mr William Maccall; and
(5.) Mr Andrew Gemmell,—all three lead-miners.

III. Crawick, near Sanquhar—

Mr John Laidlaw, formerly lead-miner at Wanlockhead.

IV. Abington—

Mr Hope Macqueen, builder and joiner.

V. Thornhill—

Dr Grierson, founder of the locally well-known "Grierson Museum."

In the paper that follows, I propose to embody the results of my own inquiries concerning the *modern history* of gold-finding in the Crawford-Lindsay hill district, which extends into Dumfriesshire, though the most important part of it, with its former capital and castle, is in Lanarkshire. The *ancient history* of these Crawford Moor gold-diggings is perhaps more interesting than that which is modern. But it is also less exact or authentic, while it is more voluminous; and it naturally, therefore, falls to be treated separately.

We may conveniently study the subject of *recent* gold-finding among the Lowthers under three heads—

I. Alluvial or stream-gold: that which occurs in the form of

small, rough, granular nuggets, generally with more or less adherent quartz.

II. Auriferous quartz: gold in quartz veins, these veins being found *in situ* in the Lower Silurian slates of the district.

III. Spurious or dubious specimens of gold or gold-quartz—usually the latter—which, though found in the district, probably do not belong to it.

Of alluvial gold, from nuggets big enough to make breast-pin heads down to granular dust, there is no scarcity. It may be collected at any time by simple washing from the beds or banks of any of the streams of the district. The Elvan is said to be the richest bed—that which is most prolific—which most profitably rewards the miner's toil. But there is concurrent or unanimous testimony that *all parts of the district are auriferous.* Whenever a supply of gold is wanted for museum specimens, or for presentation jewellery, a sufficiency is forthcoming; a few hours' work of a miner, and still more, of course, the conjoint efforts of a band of miners extending over several days, produce the number of grains or ounces required.

Mr John Laidlaw once got a nugget of 18 grains in a small burn near the Hole farm (the name of the farmer at the time being Gibson); and he told me that some years ago a girl found a nugget of 1½ oz., with a piece of adherent quartz. The whole mass was described as having been of the size of a thumb. It was sold to the late Dr Martin of Leadhills for £5 or £6. This Mr Laidlaw regarded as unquestionably a native of the district. Another nugget, the size of a horse-bean, was also found by the late David Helbet, but my informant did not say where.

Mr Robert Laidlaw described to me a 30-grain nugget, with adherent quartz, that was found by his father—the above Mr John Laidlaw—at Wanlockhead. On another occasion as much granular or nuggety gold was readily collected as was required to make a finger-ring.

Mr Wm. Maccall is the possessor and vendor, like so many other miners, of the minerals of Wanlockhead. But these minerals never include gold, he says, because it is usually purchased as soon as it is collected; or it is only collected to order and for some special purpose.

Various finds—both of gold dust and nuggets—are given by the Rev. Dr Porteous.[1]

In the case of nuggets, the adherent quartz is sometimes in

[1] In his 'God's Treasure-House in Scotland' (1876), pp. 50, 51.

sufficient quantity to be visible to the naked eye. In certain other cases the quartz predominates over the gold to such an extent that the specimens represent *auriferous quartz* instead of quartzy nuggets. Thus, Mr John Laidlaw once found, he told me, a piece of auriferous quartz, of the size of a pea, in a burn that runs into the Mennock.

This comparative abundance of *auriferous quartz* in small, rough, little, water-worn pieces, points to the probable existence of auriferous quartz-reefs in the slates of the district. But there is only one authentic instance known to me of the occurrence of such a reef,—viz., that mentioned by the Rev. Dr Porteous, who says, "a gold-bearing vein of quartz, 4 or 5 inches thick, is to be found on the Broad Law."[1] He also goes on to state that quartz from the Longcleuch was analysed in Glasgow in 1858, with the result that it contained 3 dwt. 8 grains of gold to the ton of quartz.[2] Mr James Aitchison, Leadhills, whose windows contain an exhibit of the minerals of the district, is said to have found auriferous quartz *in situ*, and to have had it analysed. But not succeeding in seeing himself when I visited Leadhills in July last, I am not in possession of details.

Of auriferous quartz found in the district, but *probably not belonging to it*, the most famous example is the "Gemmell Quartzite," which I now believe to be *Australian*. In my account of what I then knew of it in 1875, I stated explicitly—"There is a flaw in the evidence as to the said Quartzite belonging to the rocks of Wanlockhead, in so far as the mass was found loosely by itself on the side of a public road, and it has been found impossible to trace it to any of the quartz, *in situ*, in the subjacent or surrounding Silurian slates." Not, however, until last summer (July 1877) was I in a position to study on the spot this "flaw in the evidence." But now, as I have shown elsewhere, I think the specimen in question has been satisfactorily traced, not to the rocks of the district, but to a collection of *Australian* gold-quartzes to be found in the possession of Mr Robert Laidlaw, within a stone's-cast of the place where the "Gemmell Quartzite" was discovered the day after the said collection was moved to its

[1] This vein, however, does not appear to be known to the officers of the Geological Survey: for Professor Geikie, who is of opinion that the whole Leadhills district has been carefully surveyed and mapped, informed me, in a letter of date 31st December 1874, that "the gold of that region has not been met with *in situ*, but only in the alluvium."

[2] 'God's Treasure-House,' p. 57.

present quarters. The Rev. Dr Porteous strongly expresses his opinion of the foreign nativity of Gemmell's specimen.[1]

A policeman at Leadhills, named Benzie, picked up a piece of gold-quartz there; but, as in Gemmell's case, there is no proof of its belonging to the rocks of the district.

Even in a district in which gold is well known by sight, and in which the miners are shrewd and sagacious, there are individuals, not miners, who are misled by the yellow metallic appearance of certain baser ores into the belief that they are gold. Of this I had an example in the man who drove me, in July last, across the hills from Sanquhar to Abington; an intelligent man, acquainted both with the district, and with the leading miners and their gold-finds. Among the minerals displayed in the windows of Mr James Aitchison, aforesaid, were some iron pyrites, which were pronounced to be gold by the driver in question.[2]

My general conclusions concerning the Crawford-Lindsay gold-field and its possible auriferous produce are the following :—

1. There is ample evidence—quite as ample as that furnished by Sutherland in 1869, and by New Zealand in 1861-2, in regard to their respective gold-fields and their richness in gold—that the district in question is a veritable *gold-field.*

2. The evidence, however, which is perfectly satisfactory as regards surface or alluvial gold, is far from being equally so as concerns auriferous quartz, *in situ.*

3. But not even as regards stream gold has the capacity of the district been in any way properly *tested or proved.* In modern times there has been no proper working of the surface deposits, on a large scale and in a systematic way; none of a kind that is entitled to be considered more than dilettante or amateur.

4. Still less is there any means at present of judging of the extent or richness of the *auriferous reefs* of the district.

5. I have no doubt that even the same amount and kind of work—by competent gold-finders and diggers—as was expended upon Kildonan, would bring out results quite as favourable as did

[1] In his (1) 'God's Treasure-House,' pp. 54, 55; and in the (2) 'Dumfries Herald' of April 4, 1877.

[2] I have given an account of the egregious mistakes that have been made in regarding iron pyrites, mica, or other gold-like minerals, as gold in (1) 'The Transactions of the Geological Societies of Edin., 1870, and Dublin, 1871, under the head of the 'Lomond Diggings of 1852;' and in (2) 'The Northern Ensign' of July 1869, in connection with the Sutherland Diggings of that year.

the short-lived Sutherland diggings of 1869, in regard to that northern gold-field.

6. But, unfortunately, however desirable it is both as a social or economic, and as a mineralogical or scientific question, to institute *systematic operations* in the Leadhills district, there are the same kinds of difficulties to be encountered as in Sutherland.[1]

REVIEWS.

Transactions of the Glasgow Society of Field Naturalists, Part V. Published by the Society. Glasgow: 1877.—This Part of the 'Transactions of the Glasgow Field Naturalists' Society' is, as usual, well got up, but ought more properly to have been entitled "Proceedings" rather than "Transactions," as, with one or two exceptions, brief abstracts only are given of the papers read. Of the papers given at greater length, one by Mr A. S. Wilson, "On the probable Reasons why certain Plants occur most frequently in the vicinity of Human Dwellings," deserves notice. There is also a paper by Dr Stirton upon "Additions to the Lichen Flora of South Africa," which will commend itself to the attention of lichenologists, but seems to us rather out of place in these Transactions. We would suggest that it would be an improvement if in future parts the use of the terms "rare" and "very rare" was not so frequent, or at least applied only to species which really deserve it.

Proceedings of the Natural History Society of Glasgow, Vol. III. Part II. Glasgow: 1877. Pp. 97-220.—Like the Transactions just mentioned, this Part is, like former ones, well got up, with good paper and clear type. It includes the proceedings of the Society from September 1876 to April 1877; and as twenty-nine papers by thirteen or fourteen authors are given more or less in full, the volume merits the name of "Transactions" as well as "Proceedings." Most of the papers are zoological, and are almost all on vertebrates or insects, though Professor Young and Mr Young notice fossil species of some of the other sub-kingdoms, and Mr David Robertson has a note or two upon Mollusca. The latter gentleman is credited in the table of contents with the discovery of two species of fresh-water mollusca new to Scotland—viz., *Planorbis complanatus* and *Pisidium fontinale;* but on turning to his paper, we find that he alludes to the fact of *Pl. complanatus* (under its synonym *marginatus*) having already been recorded in the Society's Proceedings (i. 247, and 'Sc. Nat.' ii. 207), and that it is the var. *Henslowianum* of *Pisidium fontinale* that is meant. *Pisidium fontinale* is of course a well-known Scottish shell, but we believe the var. in question has not hitherto

[1] These difficulties were described in a paper laid before the British Association in 1869, under the title of 'The Sutherland Gold Diggings as a Scientific and Social Experiment.'

been recorded. *Planorbis complanatus* is from the same locality as previously noted—viz., Lochend Loch, Edinburgh, where it has probably now been destroyed, as the loch is used as a receptacle for the town's refuse.

"On Uniformity of Method in recording Natural History Observations, especially as regards Distribution and Migration," by Mr J. A. Harvie-Brown; "Observations on the Study of the Phytophagous Hymenoptera," by Mr P. Cameron; and "Notes on a New Method of fixing Fronds of Carboniferous Polyzoa on a layer of Asphalt, to show the Celluliferous Face," by Mr J. Young, are the titles of three of the papers, full of practical instruction, and likely to be most useful. Mr Mahoney gives a chatty paper on the "Natural History and Archæology of Donegal;" and Mr J. Napier, amongst other anecdotes, gives one of a dog which we cannot resist epitomising. A terrier, it seems, was in the habit of taking any rat that he had killed into the house to show to his mistress, who always ordered him out, but followed him with a reward in the shape of a piece of oat-cake, which the dog ate, and then buried the rat in the garden. One day, after he had been playing with his friend, a Newfoundland dog, the terrier was seen to go into the garden, dig up the rat that had been last buried, take it into the house, get the usual reward, which he shared with his companion, and then re-inter the rat.

By the way, we notice that our friends in the west still seem to labour under the illusion that Rannoch forms a part of Clydesdale.

The Part is provided with a plate illustrative of *Sulcoretepora Robertsoni*, Y. and Y., a new fossil polyzoan; and other new species described are the Hymenopterous *Blennocampa alchemillæ* Cameron, and the Dipterous *Cecidomyia cerastii* Binnie, *C. piloselle* Binnie, and *C. quercus* Binnie.

CRYPTOGAMIC SOCIETY OF SCOTLAND.

The Third Annual Conference was held at Dunkeld on October 17th-19th, and was successful in every way. Fungi were scarce, as they have been everywhere; but still there were enough to indicate what a rich field Dunkeld would be in a more prolific season. A separate account of the meeting has been already published, so we need say no more but that the next Conference will be held in Edinburgh about the beginning of next October, under the presidency of Professor Balfour, and will no doubt be very successful.

The Society is just about to publish a first fasciculus of Scottish Fungi, containing 100 species, including many of the new and rare ones.

INSECTA SCOTICA.

THE LEPIDOPTERA OF SCOTLAND.

(*Continued from page* 175.)

EDITED BY F. BUCHANAN WHITE, M.D., F.L.S.

VARIATA Schiff. Var. *obeliscata* Hb. Common. Pinetal. Ascends to 1300 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde ♀ West Ross ♀

LAT. 54°40′-57°40.′ RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-September. LARVA. Most months. FOOD-PLANT. Scots fir (*Pinus sylvestris*).

The typical form is greyish, and is on the whole less boreal in its distribution than the brown or fulvous var. *obeliscata*. The ab. *obliterata* B.W. (much suffused with brownish fuscous, and all the markings more or less indistinct) occurs at Paisley, &c.

FIRMATA Hb. Local; probably overlooked. Pinetal. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed ♀ Forth Tay Dee ♀ o o
WEST. Solway Clyde ♀ West Ross o

LAT. 54°40′-57°. RANGE IN EUROPE. Britain, Holland, Germany, Livonia. TYPE. Occidental. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July. LARVA. September-May. FOOD-PLANT. Scots fir.

YPSIPETES Steph.

RUBERATA Frr. Local. Nemoral. Ascends to about 1000 feet.

DISTRIBUTION—EAST. ♀ ♀ Tay ♀ o o o o
WEST. ♀ Clyde ♀ o o

LAT. 55°40′-56°40′. RANGE IN EUROPE. Britain, Pyrenees, Switzerland, Lapland, St Petersburg. TYPE. Occidental. TYPE IN BRITAIN. English?

TIME OF APPEARANCE—IMAGO. May, June. LARVA. July, August. FOOD-PLANT. Sallow.

TRIFASCIATA Bkh. (1794); *impluviata* Hb. (after 1797). Common. Amongst alders. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde ♀ ♀ Hebrides

LAT. 54°40′-58°30′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May. LARVA. August, September. FOOD-PLANT. Alder.

SORDIDATA F. (1794); *elutata* Hb. (after 1797). Abundant. Nemoral. Ascends to about 1700 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray Sutherland Orkney ♀♀
WEST. Solway Clyde ♀♀ ♀ ♀

LAT. 54°40′-59°10′. RANGE IN EUROPE. Northern and central. TYPE. Septentriono-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. May, June. FOOD-PLANT. Sallow, &c.

Many forms occur, but as all pass one into the other it seems undesirable to mention the names that have been applied to some of the more marked.

CIDARIA Tr.

SITERATA Hufn. (1769); *psitticata* Schiff. (1776). Common. Nemoral.

DISTRIBUTION—EAST. Tweed ♀ Tay Dee Moray o o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40′-57°40.′ RANGE IN EUROPE. Central, &c. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. September-June. LARVA. June, August. FOOD-PLANT. Various trees.

MIATA L. Common. Nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray Sutherland o o
WEST. Solway Clyde ♀ West Ross o

LAT. 54°40′-58°30′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. September-May. LARVA. June-August. FOOD-PLANT. Various trees.

CORYLATA Thnb. Common. Nemoral. Ascends to 1500 feet.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray ♀ o o
WEST. ♀ Clyde Argyle West Ross ♀

LAT. 55°40′-57°40′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE — IMAGO. June. LARVA. July - September. FOOD-PLANT. Birch, &c.

The ab. *albocrenata* Curtis, in which the whole centre of the wing is occupied by a more or less broad, pale band, is not uncommon in mountain glens.

TRUNCATA Hufn. (1769); *russata* Bkh. (1794). Common. Nemoral. Ascends to 1400 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀♀
Orkney o

WEST. Solway Clyde ♀♀ West Ross ♀♀

LAT. 54°40′-59°10′. RANGE IN EUROPE. Central and northern; (not in Iceland). TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May-August. LARVA. August-April; May, June. FOOD-PLANT. Low plants.

IMMANATA Hw. Abundant. Nemoral. Ascends to 1500 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray Sutherland Orkney Zetland

WEST. Solway Clyde ♀♀ ♀♀ ♀♀

LAT. 54°40′-60°20′. RANGE IN EUROPE. Central and northern; (occurs in Iceland). TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE — IMAGO. July. LARVA. April - June. FOOD-PLANT. Low plants.

This and the last are exceedingly similar, but differ in the shape of the front wings, and of the central band, and in the time of appearance. Both species are variable, but *immanata* especially; but amidst so many aberrations, passing one into the other, it seems undesirable to distinguish any by the names which have been applied to them.

SUFFUMATA Hb. Common. Nemoral and ericetal. Ascends to above 2000 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀♀ o o

WEST. ♀♀ Clyde ♀♀ ♀♀ ♀♀

LAT. 55°30′-57°40′. RANGE IN EUROPE. Northern and central. TYPE. Septentriono-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May. LARVA. June. FOOD-PLANT. Low plants.

The ab. *piceata* Stph. (nearly unicolorous, fuscous brown) occurs in several places.

SILACEATA Hb. Not common. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Moray ♂ ♂ ♂
WEST. ♂ ♂ Clyde Argyle West Ross ♂

LAT. 55°30′-57°40.′ RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. August, September. FOOD-PLANT. *Epilobium*, &c.

A variable species, of which some varieties have been named. In more southern regions there is a second brood in August.

FULVATA Forst. Common. Agrestal and pascual. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♂ ♂ ♂
WEST. Solway Clyde ♂ ♂ ♂

LAT. 54°40′-57°40′. RANGE IN EUROPE. Central, &c. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July. LARVA. May, June. FOOD-PLANT. Rose.

DOTATA L. (1758); *pyraliata* F. (1787). Not very common. Nemoral. Ascends to 1100 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee ♂ ♂ ♂ ♂
WEST. Solway Clyde ♂ West Ross ♂

LAT. 54°40′-57°30′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. May, June. FOOD-PLANT. Bed-straw, &c.

This must not be confounded with *dotata* of British lists, which is *associata* Bkh., and is reported to occur in Clyde; but as I have not seen specimens, I prefer to omit it at present.

LYGRIS Hb.

POPULATA L. Common. Nemoral and ericetal. Ascends to 2500 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray Sutherland Orkney ♂
WEST. Solway Clyde ♂ ♂ ♂

LAT. 54°40′-59°10′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. May, June. FOOD-PLANT. Blaeberry (*Vaccinium myrtillus*), &c.

The ab. *musauaria* Frr. (much infuscated and sometimes unicolorous fuscous brown) occurs amongst the mountains.

BIOLOGICAL LAB WOODS HOLE

TESTATA L. Common. Nemoral and ericetal. Ascends to above 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray Sutherland Orkney ♀♀

WEST. Solway Clyde ♀♀ West Ross ♀♀

LAT. 54°40′-59°10′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. May. FOOD-PLANT. Birch, sallow, &c.

PRUNATA L. Common. Hortensal. Ascends to 1100 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀♀ Orkney o

WEST. Solway Clyde ♀♀ ♀♀ o

LAT. 54°40′-59°10′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July. LARVA. May, June. FOOD-PLANT. Currant and gooseberry.

Possibly, like some other species, which are almost confined to cultivated plants, this may have been introduced. *L. reticulata* F. has been recorded from Rannoch, but certainly in error, as the food-plant (*Impatiens*) does not occur there nor elsewhere in Scotland, at least in a wild state.

PELURGA Hubn.

COMITATA L. Not common. Agrestal.

DISTRIBUTION—EAST. Tweed Forth Tay ♀♀ ♀♀ Sutherland o o

WEST. Solway Clyde ♀♀ ♀♀ o

LAT. 54°40′-58°30′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July. LARVA. August, September. FOOD-PLANT. *Chenopodium*.

SCOTOSIA Steph.

DUBITATA L. Rare. Hortensal?

DISTRIBUTION—EAST. ♀♀ Forth Tay o o o o o

WEST. Solway ♀♀ o o o

LAT. 54°50′-56°30′. RANGE IN EUROPE. Central (Finland, &c.) TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. August-April. LARVA. May, June. FOOD-PLANT. *Rhamnus catharticus* and —— ?

EUCOSMIA Steph.

UNDULATA L. Rare. Nemoral.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. [Solway] o o o o

LAT. 56°30′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June. LARVA. August, September. FOOD-PLANT. Sallow.

PHIBALAPTERYX Steph.

LAPIDATA Hb. Rare. Ericetal.

DISTRIBUTION—EAST. o Forth Tay ♀ Moray Sutherland ♀ ♀
WEST. o Clyde Argyle ♀ ♀

LAT. 55°30′-58°30′. RANGE IN EUROPE. Scotland, Finland, Lapland, W.C. Germany, S.E. France, &c. TYPE. Septentrional. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. September. LARVA. May, June. FOOD-PLANT. ——?

VITTATA Bkh. (1794); *lignata* Hb. (1799). Not common. Palustral.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde Argyle ♀ o

LAT. 54°40′-57°40′. RANGE IN EUROPE. Northern; S. Lapland, Holland, Britain, &c. TYPE. Septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June. LARVA. August, September. FOOD-PLANT. *Galium palustre.*

CAMPTOGRAMMA Steph.

BILINEATA L. Common. Agrestal and nemoral. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray Sutherland Orkney ♀♀
WEST. Solway Clyde ♀♀ West Ross ♀

LAT. 54°40′-59°-10′. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August, April. FOOD-PLANT. Grasses.

C. fluviata is recorded in Merrin's 'Lepidopterists' Calendar' as occurring in "Rannoch,"—a careless mistake for "Ranworth," a very different locality.

EUPITHECIA Curt.

OBLONGATA Thnb. (1784); *centaureata* F. (1787). Local. Hortensal, &c.

DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. Solway Clyde o [West Ross] o

LAT. 54°40′-56°30′. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. May-August. LARVA. August, September. FOOD-PLANT. Many plants, especially the flowers and seeds.

VENOSATA F. Local. Pascual, &c.

DISTRIBUTION—EAST. ♀ o o o o o o o
WEST. Solway o o o o

LAT. 54°50′. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. July. FOOD-PLANT. The flowers and unripe seeds of various species of *Silene* and *Lychnis*.

SUBNOTATA Hb. Not common. Usually maritime.

DISTRIBUTION—EAST. ♀ ♀ [Tay] o o o o o
WEST. Solway ♀ o o o

LAT. 54°50′. RANGE IN EUROPE. Britain, Germany, France, Finland, &c. TYPE. Occidento-central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August, September. FOOD-PLANT. *Chenopodium* and *Atriplex* (flowers and seeds).

PULCHELLATA Stph. Common. Amongst foxglove. Ascends to 1400 feet.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray Sutherland o o
WEST. Solway Clyde ♀ West Ross ♀

LAT. 54°40′-58°30′. RANGE IN EUROPE. Britain, Castille, West-Central France, West-Central Germany. TYPE. Occidental. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May-July. LARVA. July, August. FOOD-PLANT. Foxglove (unripe seeds).

E. linariata F. has been reported from Forth and Dee. *E. pusillata* F. (an English species), whose larva feeds on spruce, is reported from Clyde, and ought to occur. *E. abietaria* Göze, which feeds on the unripe seeds of spruce, and has a wide North European range, should be looked for.

TOGATA Hb. Local. Ericetal.
DISTRIBUTION—EAST. ♀ ♀ Tay ♀ o o o o
WEST. ♀ Clyde o o o
LAT. 55°50′-56°50′. RANGE IN EUROPE. Central and northern.
TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. September. FOOD-PLANT. Spruce (in the cones).

RECTANGULATA L. Common. Hortensal.
DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ West Ross o
LAT. 54°40′-57°30′. RANGE IN EUROPE. Central and northern.
TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July. LARVA. April, May. FOOD-PLANT. Apple (flowers).

[SUCCENTURIATA L. Rare.
DISTRIBUTION—EAST. o o o o [Moray] o o o
WEST. o [Clyde] o o o
LAT. RANGE IN EUROPE. Central and northern.
TYPE. Centro-septentrional. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. July. LARVA. August, September. FOOD-PLANT. Flowers of *Artemisia*.

I think that possibly the Clyde and Moray specimens may belong to *subfulvata*, which at one time was considered to be a variety of this.

THE COLEOPTERA OF SCOTLAND.

(*Continued from p.* 180.)

EDITED BY D. SHARP, M.B.

TRACHYS Kies.

TROGLODYTES Gyll. Very rare.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

THROSCIDÆ.

THROSCUS Bour.

DERMESTOIDES L. Very local.
DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway Clyde o o o

ELATERIDÆ.

LACON Kies.

MURINUS L. Scarce. Lowland.

DISTRIBUTION—EAST. ♀♀ ♀♀ Tay o o o o o o

WEST. ♀♀ ♀♀ o o o

ELATER Kies.

[LYTHROPTHERUS Germ.

"Raehills in decayed birch-trees during winter. Very rare. Rev. W. Little." Murray Cat. It is probable these specimens were wrongly determined; possibly they might be *E. pomorum*.—D. S.

POMORUM Hbst. Very rare.

DISTRIBUTION—EAST. o o Tay Dee o o o o

WEST. o o o o o

BALTEATUS L. Local.

DISTRIBUTION—EAST. ♀ Forth Tay ♀ Moray o o

WEST. Solway Clyde o o o

TRISTIS L. Very rare. Highland.

DISTRIBUTION—EAST. o o Tay o o o o o

WEST. o o o o o

NIGRINUS Hbst. Local. Highland.

DISTRIBUTION—EAST. o o Tay Dee Moray o o o

WEST. o o o o o

CRYPTOHYPNUS Kies.

MARITIMUS Curt. Riparial. Local.

DISTRIBUTION—EAST. o o Tay ♀ Moray o o o

WEST. Solway ♀ o o o

RIPARIUS F. Common.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray Sutherland o Zetland.

WEST. Solway Clyde ♀ o o

SABULICOLA Boh. Riparial. Rare.

DISTRIBUTION—EAST. o o o o o o o o

WEST. Solway o o o o

PULCHELLUS L. Riparial. Very rare.

DISTRIBUTION—EAST. o o o o Moray o o o

WEST. o o o o o

DERMESTOIDES Hbst. Riparial. Common.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o

WEST. Solway ♀ ♀ o o

CARDIOPHORUS Kies.

[RUFIPES Fourc.

A specimen has been recently found by Mr John Dunsmore about six miles from Paisley, but further captures must be made before the species can be considered a native one.

MELANOTUS Kies.

RUFIPES Hast. Local.

DISTRIBUTION—EAST. ♀ Forth Tay Dee ♀ o o o
WEST. Solway ♀ o o o

LIMONIUS Kies.

CYLINDRICUS Payk. Local.

DISTRIBUTION—EAST. Tweed Forth ♀ ♀ Moray o o o
WEST. Solway ♀ o o o

MINUTUS L. Rare.

DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. ♀ ♀ o o o

ATHOUS Kies.

NIGER L. Not rare.

DISTRIBUTION—EAST. ♀ ♀ ♀ ♀ Moray o o o
WEST. Solway Clyde o o o

HÆMORRHOIDALIS Fab. Common.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o
WEST. Solway ♀ ♀ o o

VITTATUS F. Common.

DISTRIBUTION—EAST. ♀ ♀ ♀ ♀ Moray o o o
WEST. Solway ♀ o o o

SUBFUSCUS Mull. Very rare.

DISTRIBUTION—EAST. o o o o o o Orkney Zetland
WEST. o o o o o

LONGICOLLIS Ol. Very rare.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

"Dalmeny Park, near Edinburgh." Murray Cat.

UNDULATUS de Geer. Very rare. Highland.

DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o o

CORYMBITES Kies.

PECTINICORNIS L. Rare.
DISTRIBUTION—EAST. Tweed Forth o o o o o o
WEST. o o Argyle o o

CUPREUS Fab. Common.
DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde ♀ o o

TESSELLATUS L. Local.
DISTRIBUTION—EAST. Tweed ♀ Tay Dee Moray o o o
WEST. Solway Clyde Argyle o o

QUERCUS Gyll. Common.
DISTRIBUTION—EAST. ♀ ♀ Tay Dee ♀ o o o
WEST. Solway ♀ o o o

A variety with pale elytra is not uncommon.

HOLOSERICEUS Fab. Rare.
DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. ♀ ♀ o o o

IMPRESSUS Fab. Highland. On the Scots fir.
DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. o o o o o

ÆNEUS L. Local.
DISTRIBUTION—EAST. o Forth Tay Dee o o o o
WEST. o o o o o

AGRIOTES Kies.

SPUTATOR L. Rare.
DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. Solway o o o o

LINEATUS L. Local.
DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway o o o o

OBSCURUS L. Abundant.
DISTRIBUTION—EAST. ♀ Forth Tay ♀ Moray ♀ ♀ ♀
WEST. Solway ♀ ♀ ♀ ♀

PALLIDULUS Ill. Common.
DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway ♀ o o o

DOLOPIUS.

MARGINATUS L. Common.
DISTRIBUTION—EAST. ♀ Forth Tay ♀ Moray o o o
WEST. Solway ♀ o o o

SERICOSOMUS Kies.

BRUNNEUS L. Local.
DISTRIBUTION—EAST. ♀ ♀ Tay Dee Moray o o o
WEST. Solway ♀ o o o

ADRASTUS Kies.

LIMBATUS Fab. Rare.
DISTRIBUTION—EAST. ♀ o o o o o o o
WEST. Solway o o o o

CAMPYLUS Kies.

LINEARIS L. Local.
DISTRIBUTION—EAST. Tweed ♀ Tay Dee Moray o o o
WEST. Solway ♀ o o o

DASCILLIDÆ.

DASCILLUS Kies.

CERVINUS L. Local. In old pasture lands.
DISTRIBUTION—EAST. ♀ ♀ Tay Dee Moray o o o
WEST. Solway Clyde o o o

HELODES Kies.

MINUTA L. Common.
DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o
WEST. Solway Clyde o o o

MARGINATA F.—Common. On herbage near burns.
DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ o o o

LIVIDA F. Common.
DISTRIBUTION—EAST. Tweed Forth ♀ Dee Moray o o o
WEST. Solway ♀ ♀ o o

The variety *H. Bohemanni* Th. has occurred near Dumfries.

CYPHON Kies.

COARCTATUS Payk. Common.
DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀♀ o o

NITIDULUS Th. Common.
DISTRIBUTION—EAST. ♀♀ Forth Tay Dee Moray o o o
WEST. Solway Clyde o o o

PADI L. Common.
DISTRIBUTION—EAST. ♀♀ Forth Tay ♀♀ Moray o o o
WEST. Solway ♀♀ o o o

VARIABILIS Thun. Abundant.
DISTRIBUTION—EAST. Tweed Forth Tay ♀♀ Moray o o o
WEST. Solway ♀♀ ♀♀ o o

PALLIDULUS Boh. Local.
DISTRIBUTION—EAST. ♀♀ ♀♀ Tay Dee ♀♀ o o o
WEST. Solway ♀♀ ♀♀ o o

PUNCTIPENNIS Sharp. Rare.
DISTRIBUTION—EAST. o o Tay Dee o o o o
WEST. Solway o o o o

HYDROCYPHON Kies.

DEFLEXICOLLIS Mull. Common. Near rivers and streams.
DISTRIBUTION—EAST. Tweed ♀♀ ♀♀ Dee Moray o o o
WEST. Solway ♀♀ ♀♀ o o

SCIRTES Kies.

HÆMISPHÆRICUS L. Very rare.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

MALACODERMIDÆ.

EROS Kies.

AURORA Fab. Very local. Highland.
DISTRIBUTION—EAST. o o Tay Dee o o o o
WEST. o o o o o

(To be continued.)

ZOOLOGY.

ON MIGRATION.

By Colonel DRUMMOND HAY, C.M.Z.S.

(*Continued from page* 144).

MR WALLACE, in commenting on the dangers of the passage across ocean to Quail and other birds, further says: "Quails cross in immense flocks, and great numbers are drowned at sea *whenever the weather is unfavourable;* some individuals always stay through the winter in the south of Europe, and a few even remain in England and Ireland, and were the sea to become *a little wider*, the migration would cease, and the Quail, like some other birds, would remain divided between south Europe and Africa."

Of the dangers of a long sea-passage to migrants, and the occasional drowning of many when meeting with tempestuous weather, there can be no doubt; and the same may be said of the ship and its living freight. Hardly are we ever visited with severe gales on our coasts but we have the most heartrending details of shipwreck and the loss of human life; but as it is with the ship, so I take it to be with the bird—the proportion that cross in safety is infinitely greater by many times than that of the loss sustained. But it is not only to migratory birds on their passage that stormy and tempestuous weather proves perilous, but even to our very water-birds, whose home is the ocean, does this often happen; and on this subject Mr Gould says,—"Violent and heavy gales frequently lend their aid to the destruction of bird-life, as evidenced by our shores being often found, after their occurrence, literally strewn with Guillemots, Razor-bills, and other sea-birds;" in proof of which he gives two instances, as recorded in the 'Zoologist' for 1872—one in the Isle of Wight, the other in Cornwall—in which for miles the shore was covered with the dead bodies of various sea-birds, including even Gannets, which were doubtless drowned at sea. But though this loss of life may occasionally occur, I take it as by no means the rule that, owing

to unfavourable weather, or the length of sea to be traversed, birds are of necessity drowned. Thousands upon thousands pass over in safety. Migratory birds in their long journeys encounter many dangers, and are liable to many casualties: numbers are often killed by dashing themselves against the lighthouses on our coasts; and it is not only in the storm, but even in the calmest of weather, that accidents may, and do frequently, occur. It may be from some constitutional weakness, that, unable to fly at the proper height, or incapacitated from going further, the water is touched, the feathers are wetted, and the bird is lost. But with all this, we may be assured that He who hath said not a sparrow shall fall without His knowledge, has equally ordained that, in nature's proper course, there shall be no undue loss of life, and that everything should fulfil its own special purpose and maintain its own proper balance; and though man may disturb it by the ruthless destruction of many creatures, that in no way sets aside the design of a beneficent Creator.

A somewhat affecting incident was witnessed by me when near the mouth of the St Lawrence: one fine afternoon, towards the end of August, the sea being quite calm, and the schooner in which I was about eight or ten miles off the northern shore, a party of six or seven small birds were seen flying towards the vessel, which they passed about fifty yards astern, without any seeming intention of alighting. Suddenly one of their number faltered, and dropped; the remainder, wheeling round, came to the rescue, evidently in great distress, making every effort to save him by trying to lift him up; but at last, finding it hopeless, they left their companion to his fate, and sped on their way, some eighty or a hundred miles further on, to the Gaspé shore. A boat was immediately lowered, and as the bird was still fluttering in the water, we were in great hopes of saving it, but when reached life was extinct. On examination, it proved to be an American Redstart (*Setophaga ruticilla*), a young bird of the year.

Were the width of the sea increased, I will not say *a little*, but *very considerably*, the probability is that migration would cease; but who shall say what the distance should be to effect this? Much, I surmise, would depend on the prevailing winds on the line of passage during the migratory periods. As to birds traversing large extents of ocean, it is well known that they do so. Many of the American birds even find their way to this country, a distance of 2000 miles (a subject on which I shall have occasion again to refer); and many instances occur in which they

have been encountered on the broad Atlantic hundreds of miles away from any shore. Mr Gray says[1] that, some years ago, his friend, Mr Dewar, when sailing from America to this country, observed great numbers of American White-winged Cross-bills crossing the Atlantic before a stiff westerly breeze, and many of the flocks alighted on the rigging and deck of the steamer, which at the time was about 600 miles east of the Newfoundland coast; and the late Mr Thompson, in his 'Birds of Ireland,' has recorded one case, in which from fifty to sixty Snowy Owls were seen 500 miles from land on their way across; and Mr Cavendish Taylor, when on a voyage across the North Atlantic during the month of July, and about 350 miles from the coast of Ireland, saw a pair of Curlews (species not stated) which passed the ship, bound to the eastward. When first noticed they were at some distance, but were distinctly seen through a glass: they then flew near the ship, as if to reconnoitre, and went rapidly a-head, flying just above the surface of the water.[2] Who can say whence these birds came? It is not likely that a strong-winged bird like the Curlew had been blown off any shore, and that they were now returning to land, or that they had been induced to follow any ship, which occasionally migrants do, when coasting from headland to headland, or island to island, and are thus inveigled out to long distances from land, and by keeping with the ship eventually cross the ocean. A seeming instance of this once came under my own observation, when, in the month of November, on passing through the Azores, and at some little distance to the south and westward of Fayal and Pico, but still in sight of land, a Skylark and a Starling came off to the ship. The former left us either the next morning or the following, veering off to the south-east in the direction of Madeira; the Starling, however, remained about the ship till within two days' sail of the Bermudas, when, as if actuated by some sudden impulse, it darted off in a southerly direction, which, if pursued, would have landed him on some of the West India Islands; but whether the poor bird ever fell in with another ship or reached the land in safety, it is impossible to say. I only mention this to show that this is one way in which birds may be encountered in mid-ocean. A curious case of this sort is recorded by Mr C. E. Smith, on the authority of Captain Gravil, of the whaler Diana:[3] "During one of the re-

[1] 'Birds of W. Scotland,' p. 156.
[2] 'Ibis,' 1869, p. 390.
[3] 'Zoologist,' 1866, p. 455.

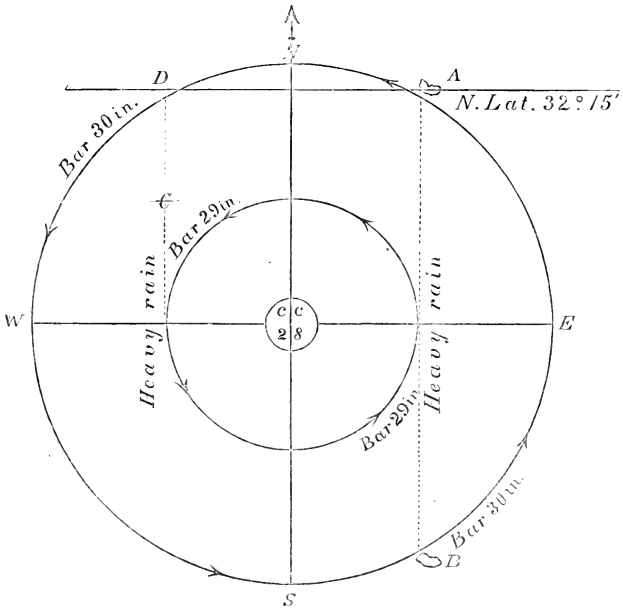
turn voyages to England, in the late autumn, a Rook, completely exhausted, came on board the vessel in the North Sea, 220 miles from the nearest land—namely, the north of Scotland. The bird was caught, and well cared for, and after a few days set at liberty, but did not leave the vessel—remaining on board, hopping about the deck among the men, and roosting in the rigging at night. At Shetland, Captain Gravil sent the bird on shore, and sailed the same evening for Hull. The next morning, when more than 40 miles from Lerwick, and out of sight of land, the sailors were astonished at seeing their late comrade winging his way to the vessel, on which he presently alighted, with a great cawing, and every sign of satisfaction. He continued with them till the vessel arrived in Hull, when the poor bird was unfortunately killed, much to the regret of the crew, by some mischievous boys."

These, however, are all exceptional cases—birds which have been either driven, or accidentally drawn, out of their natural course. The Quail, and many other birds, as I have attempted to show, cross in their direct line of passage an extent of sea, in some parts of the Mediterranean, of more than 500 miles without rest, and without food; and I think there is quite sufficient proof to show that very considerably longer distances are accomplished in the regular line of passage over the ocean, in other parts of the world, by birds of quite as feeble a flight, and even more so, than the Quail. When in the Bermudas, which are peculiarly adapted for noticing birds during their passage, I had frequent opportunities of so doing, and not only from my own observations and that of others, but especially from the valuable and authentic information on the subject collected by Mr J. E. Jones, and which is to be found in his very useful little work, 'The Naturalist in Bermuda,' from which I have already quoted at the beginning of this paper, I feel convinced that one, if not the principal, line of migration from the north-eastern parts of North America is by Nova Scotia, the Bay of Fundy, and State of Maine, in a nearly due southerly course, across the ocean to the West Indian Archipelago, and so on to South America. Taking the starting-points to be Cape Sable in Nova Scotia, or Cape Cod in Massachusetts, the distance to be traversed would be more than three times the distance shown in the Mediterranean—the distance from Cape Sable to Bermuda 690 geographical miles, and that from Bermuda to St Thomas or Porto-Rico, the nearest land in a due southerly direction, 825 miles, making, in all, over 1500 miles

from land to land. This from the nearest places; but there is quite sufficient proof to show that the direct line of flight is from much further north—even from the shores of Newfoundland. Taking this direct line of passage to apply to water-birds only, there is no reason why land-birds, coasting down the Bay of Fundy towards Cape Cod, should not take a direct course from thence to Cape Hatteras, and so on to the Bahamas. They would, in the one instance, perform a sea journey of little short of 500 miles, and, in the other, 600—the greatest distance from the American coast varying from 100 to 200 miles. But I think I can show that these land-birds do infinitely more than this, executing the whole distance in a single flight.

The Bermuda group, nearly equi-distant between Nova Scotia, the North Atlantic States, and the West Indies, is annually visited by large numbers of migrants, of various species, especially should strong gales set in. In the autumn months, Plover, and many of the *Tringidæ*, go south in large armies, passing either directly over in the vicinity, or even far to the eastward, of the Islands, but do not, as is the case with many birds, return by the way they went; and though possibly working their way back to their old haunts through the States, yet, strange to say, their course northwards is still undefined. Should fine and favourable weather set in, this long ocean journey is possibly effected without a single check: on the other hand, should one of the great tropical storms be encountered, which are not uncommon in these seas at this particular season, the migratory hosts would be at once driven for shelter to the nearest land. A very remarkable occurrence of this took place on the night of the 8th and the morning of the 9th of October 1849, when not only enormous quantities of many species of birds lighted on the Islands, but thousands also passed over without doing so. With regard to the state of the weather on the occasion, my friend, Mr Hurdis, long resident on the Islands, sends me the following note and observations: "Bermuda, Oct. 9, 1849. Torrents of rain fell during the whole of last night and this morning, accompanied by a strong wind from the S.W.;" and in allusion to this, as also to the numerous birds that visited the Islands on the occasion, says: "It is very evident from the same, that a tropical gale, moving from south to north, came up on the night of the 8th and 9th October, the right wing of which passed over the Bermudas. Those Isles, being in N.lat. 32°, near which these storms attain their extreme westerly range, would be swep by its right wing thus. Letter *A* represents Bermuda at the com-

mencement of the storm, and *B* its position at the close; the wind would therefore set in from S.E., veer through S., with heavy rain, and end with S.W. Had the left wing of the gale passed



over the Bermudas, the direction of the wind would have been northerly. Supposing the diagram to represent a tropical storm of 600 geographical miles in diameter, the dotted line intersecting the storm diameter, midway between the storm centre and circumference, would be 493 miles in length; and as the storm moved onwards to the north at 25 miles an hour, Bermuda would *appear* to move along that line at that pace. We will now imagine that the flight of land-birds approached the left wing of the storm from the north, entering it at the same time, and at the same distance from the line separating the two wings at the letter *D*. While Bermuda *appeared* to be travelling towards the storm diameter, at 25 miles an hour, the birds would be moving at the more rapid rate of 55 miles an hour in the same direction—that is, allowing them to fly at the moderate speed of 30 miles an hour towards the south, and adding 25 miles for the direct progress of the storm, we arrive at a united speed of 55 miles. It results, therefore, that the birds would reach the storm diameter

in about half the time that Bermuda would take to reach it in the opposite wing. Thus far the wind would have assisted the birds in their flight; but heavy rain and violent wind would now be encountered, and the latter, shifting more and more from N. to N.W., W., and S.W., the hapless birds would be drifted down wind, into the right wing of the gale, just about the time that Bermuda had advanced somewhat south of the storm diameter which passed through the Bermudas at midnight. Here the storm-driven birds would be enabled to take refuge while the remainder of the storm passed over them. Thus the flight would enter the storm at letter *D* in the latitude of Bermuda, four hours and a half before midnight—that is, 7 h. 30 m. P.M. of the 8th October, and at 9 h. 15 m. P.M. they would reach letter *C*. Three hours later they would cross the storm diameter, and from thence gradually drift with the gale to the eastward, describing a curve. When approaching the storm diameter in the right wing they would fall in with the Bermudas, having travelled over double the distance (so to speak) of these Islands. This would be in the early morning of the 9th October, say 1 A.M."

I will now give my own reminiscences of the night in question as I saw it. The evening of the 8th being stormy and boisterous, with heavy rain, and being certain, from signs I had noticed in the afternoon, that a large passage of birds might be expected, I was in all readiness, and was out by a little after two o'clock in the morning, till long after daylight. It was blowing very fresh from the S.W., and the scene which presented itself will be long impressed on my memory. Under the shelter of some hay on the glacis, behind the barracks, on the Island of St George's, I remained for several hours watching the wonderful flight passing over the Island, in a direction nearly due south. Though dark, and the birds pretty high up, still I could quite trace their course; and the incessant beat of many thousands of wings, the wild cries and sounds of many voices, told me a mighty host was passing rapidly overhead. Among the various cries, I distinctly recognised Wild-duck, Plovers, Snipe, Curlews, Tattlers, and many other *Tringidæ*. When day broke, and it was sufficiently light to see objects distinctly, I visited the shore, and there I found, to my astonishment, every cedar bush crammed with birds, literally in thousands, and apparently all of one species — the yellow-billed American Cuckoo (*Coccyzus americanus*). Nor was this great flight confined only to St George's, but, as I afterwards ascertained, extended the whole length and breadth of the Islands, a

distance of twenty miles. By the following day their numbers were greatly diminished, many having moved on in their course during the night; in two days more there was not one to be seen. With regard to this same flight, Mr Jones has the following: "Thousands—absolutely thousands—of these birds were observed among the cedar-trees on various parts of the south shore, from the Commissioner's house in Ireland Island, to Somerset, Port Royal, Walsingham, St David's, and Cooper's, and as far north as St Catharine's Fort." (I may mention, in passing, that St Catharine's Fort is in St George's, but a great body of the flight was far beyond this, to the very extremity of the Island, extending even into Paget's.) "In the course of two or three days not a straggler remained, and this is corroborated by Colonel Wedderburn, late of the 42d, a keen sportsman, and a good ornithologist, who contributed to the 'Naturalist in Bermuda' an extensive list of birds, with much valuable information. It is difficult to understand how such slender birds, with short wings and long tails, which latter I observed were frequently blown over their heads in the gale, giving them the appearance of being nothing but a bunch of feathers, can cross any extent of ocean. But this they certainly do, not only in the autumn, but also in spring; and Colonel Wedderburn records their arrival in April, when they only remained two or three days." Holding this of Mr Hurdis to be the right solution—and I can see no reason to doubt it—how was it that these land-birds were in this particular spot *D*, about 600 miles from Cape Cod, in Massachusetts, and 420 miles off the American coast, a little south of Charleston, if they were not on their *direct line* of passage from the regions about the Bay of Fundy, to the Bahamas, or other Islands in the West Indies? And a glance at the map will show this to be the true course, and it is not very likely that another tropical storm, tending along the American coast at the same time, should have placed them where they were.

Another of the shorter and weaker-winged birds, if I may so call them, that were stopped on their passage in enormous quantities on this memorable morning, was the Carolina Crake, or Rail (*Otygometra carolina*), which one could scarcely have expected to accomplish so long a voyage, and yet it visits the Bermudas regularly ('Ber. Nat.,' p. 45), arriving about the beginning of September. Weak as this bird would seem to be, not flying further than fifty yards at a flight when in its natural haunts, yet it wings its way across vast extents of ocean; and though a

few remain all winter, as noted by Colonel Wedderburn, they are recruited by fresh arrivals on their passage north in February and the ensuing months of March and April ('Ber. Nat.,' p. 53). Wilson, in his 'American Ornithology,' makes mention of their frequently being met at sea, and instances one occasion, when at more than 100 miles from land, three of these birds dashed against the binnacle of a ship returning from the West Indies, breaking the glass and putting out the light, to the great alarm of the steersman: two were killed on the spot, and one died soon after. In regard to these great flights of birds, Mr Jones has collected many interesting facts, and, among others, relates one in which Captain Edwin Jones of the schooner Bigelow ('Ber. Nat.,' p. 75), when at a distance of about 500 or 600 miles to the east of Bermuda, on or about the 12th or 13th of September 1851, the weather being fine, with a light easterly breeze, fell in with great multitudes of birds, which were taken to be the American Plover (*Charadrius marmoratus*), passing over the vessel in a southerly direction for two days in succession, in flocks, some of many thousands, some considerably less, diminishing to parties of fifty to thirty; and during the whole of the intervening night these flocks were distinctly heard passing over the ship. A portion of this flight Mr Jones believes to have been driven upon the Island of Barbadoes, shortly afterwards, having been checked on their course by a southerly gale, on which occasion the birds were so numerous that thousands were shot down, and many killed with stones. So many authentic instances are there on record of the enormous arrivals of these birds on different parts of the West Indian Archipelago, direct from the north, with no corresponding notice of their resting on the Bermudas, that it seems quite to corroborate Mr Jones's opinion that the line of passage is chiefly to the eastward of those islands, in which I quite concur as regards the Plover, showing that doubtless the whole distance is often performed in a single flight, without rest and without food; and my firm belief is, from the course taken, that when these flights are not met by adverse winds, and thereby thrown upon the West India Islands, that they reach some of the northern shores of South America without a halt. So that the fact of birds crossing the Mediterranean, even were they to do so, in a direct line from the south of France to the African shores, without touching on any of the islands, a distance in no place over 500 miles, completely falls into the shade and sinks into insignificance in comparison with these stupendous ocean

journeys, and is quite sufficient to show that the width of water required to put a stop to migration would be somewhat difficult to define. It is not only in tempestuous weather that the remote islands of the Bermudas are resorted to by migratory birds, but it is the abode in winter of several American species. The Belted Kingfisher (*Alcedo alcyon*) arrives regularly in September, taking its departure in April; the American Bittern (*Ardea lentiginosa*) and the green Heron (*Ardea virescens*) I have noticed every winter in the mangrove swamps about St George's, the latter sometimes in considerable numbers, together with some others. The number of species that may be taken as occasional, accidental, or even pretty regular in their visits, is very large; and some I have seen arrive in quite moderate weather, and with the show of so little fatigue as to be quite surprising. On one occasion I noticed a flock of some fifty small birds coming in straight from the sea in a north-westerly direction. The nearest land would be Cape Hatteras, a distance of 600 miles; but from the direction they were flying, their starting-point was probably further north, say Cape Cod, 650 miles. Yet these birds, which had been flying in a long, straggling line, on reaching land moved up into a body, and after wheeling several times round, lighted upon some cedar-trees close to me, without any apparent sign of distress. They proved to be the Pine-creeping Warbler (*Sylvicola pinus*), a bird not bigger than our little Willow Wren. But the powers of flight and endurance in small birds, in traversing such vast tracts of ocean, is perhaps nowhere better exemplified than in the occasional visit to the Bermudas of the Ruby-throated Humming-bird (*Trochilus colubris*), 'Ber. Nat.,' p. 35.

Before bringing the subject of migration, as noticed at Bermuda, to a close, I must not omit to mention one or two British birds which have found their way there; one in particular, the common English Landrail or Corn-crake, which was shot by Colonel Wedderburn in Pembroke Marsh, Bermuda, on the evening of the 25th of October 1874. This specimen, at Colonel Wedderburn's request, I took to London, and presented from him to the late Mr Yarrell; and some time afterwards, on the sale of Mr Yarrell's effects, this same specimen, which I at once recognised, was purchased by myself, and is now in my collection. I do not pretend to say that this bird crossed the whole width of the Atlantic, but, supposing it to have worked its way to the American continent by Iceland and Greenland, and so on, from Cape Sable, or even Cape Hatteras,

it must have had to cross from 600 to 700 miles of ocean before reaching the Bermudas,—and this is not unlikely, the Corn-crake seeming to be a great wanderer, having been found both in Greenland and in the United States. The bird in question, being in the plumage of the year, might have been bred in the latter place; still, the fact of its being found in Bermuda would not be the less extraordinary. But perhaps as remarkable a sea voyage as any for this weak-winged looking bird to have made, is that to the Azores; two examples having been got there, as Mr Godman informs us, in his notes on the birds of those Islands ('Ibis,' 1866, p. 102), the stuffed skins of which he had himself seen.

Another British bird is the Wheatear, which has been seen on two occasions in Bermuda, if not oftener,—once by myself ('Ber. Nat.,' p. 28); and several examples of this bird have since been noticed on the American continent, as well as two instances of the European Woodcock (*Scolopax rusticola*); and the whole of these probably found their way by Greenland. That birds, when driven by adverse gales far out of their migratory course, seem to lose all desire of migration, and become sedentary, I can well understand; but this I take to be the exception, not the rule, as very much would depend on circumstances, whether the spot to which they were wafted afforded a climate, as well as supply of food, sufficient for their wants at all seasons of the year. And this is eminently the case in the Azores; accounting for Quail, Wheatears, Woodcock, and Snipe, found as, according to Mr Godman, they are ('Ibis,' 1866, p. 108), breeding and resident the whole year. These two remote groups of islands, the Bermudas and the Azores, have much in common, both lying far out in the Atlantic, and both supporting an almost tropical vegetation; and though each have their occasional stragglers, the one of American, the other of European type, yet there is this difference,—the Azores lie *entirely* out of the line of all migration. The islands, as a whole, have an aggregate area of 700 square miles, while that of the whole Bermuda group together is not more than about 12,000 acres; besides which, the former contain high mountain-ranges of 3000 feet and upwards, surmounted by the snow-capped Pico, rearing its head nearly 8000 feet above the sea-level; while the orange and myrtle flourish beneath, at once affording a sufficient change of climate and abundance of food at all seasons of the year, especially to birds such as those mentioned, which in the first instance have doubtless reached the islands as mere

stragglers, but finding themselves, as it were, completely out of their reckoning, and yet in a place suited to their habits, would at once commence breeding, retiring to the higher mountains for that purpose, and coming down to the plains in winter, and thus performing a kind of local migration. This is just what I have noticed our common Blackbird do in the south of Greece: not one is to be seen in the plains in summer, where they were abundant all winter, leading the novice to suppose that all had migrated northwards. Go up yonder mountain a few thousand feet, and there you will meet our old friend, nesting and regaling you with his song, as if in some woodland at home. And so with these Azoreans: finding everything suited to their wants, the desire of migration becomes less and less in each succeeding generation, until it is entirely lost.

Though this local migration may not appear to apply so readily to the Quail, yet it is a bird that so easily conforms itself to circumstances, that it would soon become reconciled to sedentary habits; and Mr Godman tells us they abound in the islands, breeding three times in the year. This would seem to bear out the theory that I have advocated of the Quail breeding in Africa during its winter sojourn in that country. The Quail, though migratory to a very large extent, not only occasionally winters both in the south of England and Ireland, but is also to be found more or less resident in all the milder parts of Europe,—not because the sea is too broad for it to cross, but much more probably because late broods stay behind, where they find sufficient food and suitable climate; and so remaining, their descendants become sedentary. Were this not the case, why should a few remain all the year in Malta, and many parts of Greece, from whence they could easily migrate? I have shot them in the winter months in Macedonia, at the head of the Archipelago, where they were pretty plentiful. Had these birds wished to migrate, they might easily have done so, almost without ever going out of sight of land. These remarks may equally apply to other summer migrants which have occasionally been noticed to winter in Europe; these, however, are few: the Blackcap, the Wryneck, and some others. The Blackcap is a great lingerer,—some even remain all the year in England; and Mr Malloch, bird-stuffer, Perth, informs me that one was shot near Edinburgh, in full plumage, the year before last, late in December. Some other birds, such as the Reed Wren (*Calamoherpe arundinacea*) and Fan-tailed Warbler (*Salicaria cisticola*, Gould), winter regularly in Sicily and

the south of Italy, but I cannot think that the migratory birds which occasionally stay behind and winter in Europe, are in any way influenced by the breadth of sea they have to cross, either in passing over the English Channel or the Mediterranean, but that it arises merely from accidental causes. This is a subject on which I will not take up further time, but proceed to migration as we see it in our own country.

(*To be continued.*)

THE LEPIDOPTERA OF MONCREIFFE HILL.

By Sir THOMAS MONCREIFFE, Bart.

(Geometrina—*continued from page* 198).

Eupithecia togata.—I have only seen three specimens of this beautiful species on Moncreiffe Hill, but since the discovery of the habits of the larva, traces of its presence have been noticed in the spruce-fir cones in more than one locality. Mr Herd collected some cones last year which contained larvæ, and although most of them went down in the autumn, some are still feeding, he tells me, or at least crawling about among the cones (May 12, 1877).

Mr Herd found one larva feeding in the pith of a diseased shoot.

E. rectangulata.—Common among the apple-trees in my orchard. Some specimens are brown, with scarcely a tinge of green.

Lobophora hexapterata.—Locally common. First noticed in 1873, since which time it has been spreading over the ground. Appears to be attached to white poplar as commonly as to any other variety.

L. lobulata.—Common above 300 feet. I have never found it, or heard of its being found, on the birches at a lower altitude. This insect does not appear to vary here; we find none of the darkly-marked specimens which occur in Rannoch.

Thera variata (*obeliscata*).—Common among Scots fir. We have a dark and a pale variety here, which Mr Herd believes to be different insects. He tells me the larvæ are quite distinct, and that from one form he always breeds the dark insect, and from the other the paler. Possibly before this note is published there may be more to say on the subject.

T. firmata.—Frequent; not so common as *variata*, and does not vary.

H. elutata.—Common, and excessively variable; more inclined to melanism, I think, than any insect we have.

Melanthia rubiginata.—Common. The variety *plumbata* occurs.

M. fluctuata.—Common. Varies excessively in size and shade of colour.

Anticlea sinuata.—Rare. I know of only one specimen from Moncreiffe.

Camptogramma bilineata.—Common. Some specimens have dark bands across the fore-wings.

Cidaria psittacata.—Common. It is a pretty sight to see these insects gambolling about the standard thorn-trees on an autumn evening.

C. russata.—Common, and generally distributed. We may have *immanata*, but *russata* is so variable that I cannot feel certain.

C. testata.—Locally common some seasons. I think there are two insects mixed up under the name of *testata*. At least those which I take here, and which come commonly to light in my study, appear to me to be different from those I have taken on the heather hills, far away from wood of any sort.

C. populata.—Common at about 600 feet among bilberry. This insect varies very much, some specimens being very dark. We take a smaller, finer-looking insect at a lower elevation, where there is no bilberry—is this the usual form of the sallow-fed specimens?

Eubolia mensuraria.—Common. Varies considerably in shades of ground colour, from pale reddish orange to dark olive brown.

Chesias spartiata.—Not common. Comes freely to light.

C. obliquata.—Not common, although both these latter insects are common just out of bounds.

186. Rumia cratægata; *c*
187. Venilia maculata; *c*
188. Metrocampa margaritata; *c*
189. Ellopia fasciaria; *f*
190. Selenia illunaria; *c*
191. „ lunaria; *f*
192. Odontopera bidentata; *c*
193. Crocallis elinguaria; *r*
194. Ennomos erosaria; *r*
195. Himera pennaria; *f*
196. Phigalia pilosaria; *c*
197. Amphidasys betularia; *f*
198. Cleora lichenaria; *c*
199. Boarmia repandata; *c*
200. Tephrosia crepuscularia; *c*
201. Gnophos obscurata; *c*
202. Dasydia obfuscata; *c*
203. Geometra papilionaria; *f*

204. Ephyra punctaria ; *f*
205. ,, pendularia ; *f*
206. Venusia cambrica ; *r*
207. Acidalia scutulata ; *c*
208. ,, bisetata ; *c*
209. ,, incanaria ; *f*
210. ,, aversata ; *c*
211. ,, inornata ; *f*
212. Timandra amataria ; *r*
213. Cabera pusaria ; *c*
214. ,, exanthemaria ; *f*
215. Macaria liturata ; *f*
216. Halia wavaria ; *c*
217. Panagra petraria ; *c*
218. Fidonia atomaria ; *c*
219. ,, piniaria ; *c*
220. Abraxas grossulariata ; *r*
221. Lomaspilis marginata ; *c*
222. Hybernia rupicapraria ; *c*
223. ,, aurantiaria ; *c*
224. ,, leucophæaria ; *c*
225. ,, progemmaria ; *c*
226. ,, defoliaria ; *f*
227. Anisopteryx æscularia ; *f*
228. Cheimatobia brumata ; *c*
229. ,, boreata ; *f*
230. Oporabia dilutata ; *c*
231. ,, addendaria ; *c*
232. Larentia didymata ; *c*
233. ,, multistrigaria ; *c*
234. ,, cæsiata ; *c*
235. ,, olivata ; *f*
236. ,, pectinitaria ; *c*
237. Emmelesia alchemillata ; *c*
238. ,, albulata ; *c*
239. ,, decolorata ; *f*
240. ,, ericetata ; *r*
241. Eupithecia pulchellata ; *f*
242. ,, centaureata ; *r*
243. ,, subfulvata ; *f*
244. ,, pygmæata ; *r*
245. ,, satyrata ; *f*
246. Eupithecia castigata ; *c*
247. ,, lariciata ; *c*
248. ,, indigata ; *c*
249. ,, nanata ; *f*
250. ,, vulgata ; *c*
251. ,, absynthiata ; *c*
252. ,, minutata ; *f*
253. ,, assimilata ; *f*
254. ,, tenuiata ; *c*
255. ,, dodonæata ?
256. ,, abbreviata ; *c*
257. ,, exiguata ; *c*
258. ,, sobrinata ; *c*
259. ,, togata, *r*
260. ,, rectangulata ; *c*
261. Lobophora hexapterata ; *f*
262. ,, lobulata ; *f*
263. Thera variata ; *c*
264. ,, firmata ; *f*
265. Ypsipetes elutata ; *c*
266. Melanthia rubiginata ; *c*
267. ,, ocellata ; *c*
268. Melanippe tristata ; *c*
269. ,, biriviata ; *c*
270. ,, montanata ; *c*
271. ,, fluctuata ; *c*
272. Anticlea sinuata ; *r*
273. ,, badiata ; *c*
274. ,, derivata ; *f*
275. Coremia propugnata ; *c*
276. Camptogramma bilineata ; *c*
277. Cidaria psitticata ; *c*
278. ,, corylata ; *c*
279. ,, russata ; *c*
280. ,, suffumata ; *c*
281. ,, silaceata ; *r*
282. ,, prunata ; *c*
283. ,, testata ; *f*
284. ,, populata ; *c*
285. ,, fulvata ; *c*
286. ,, pyraliata ; *r*

287. Pelurga comitata ; *r*
288. Eubolia cervinaria ; *r*
289. ,, mensuraria ; *c*
290. ,, plumbaria ; *c*
291. Anaitis plagiata ; *f*
292. Chesias spartiata ; *r*
293. ,, obliquaria ; *r*

GLEN TILT: ITS FAUNA AND FLORA.

By F. BUCHANAN WHITE, M.D., F.L.S.

(*Continued from page* 190.)

GLEN TILT is as rich in the smaller moths as it is in the larger and more generally collected species. Amongst those more worthy of a special notice are *Scopula uliginosalis* (the *alpinalis* of British lists), which occurs in grassy places on the hills. Much rarer is *S. decrepitalis*, of which I have only seen a single specimen on the grassy banks of a burn, at about 600 feet altitude. It is possible that we have always been too late in the season for this species, or else do not know how to look for it. Of the genus *Scoparia* several species are common : amongst others, the one known as *atomalis*, but which I strongly suspect is only a form of the common *ambigualis*, which I do not remember seeing in the glen. *S. murana* is also common enough ; but *alpina*, which ought to occur, and probably does, we have not yet found.

Several species of *Crambus* have been noticed : amongst others, the rare *myellus* is said to have been taken in the glen, but we have not met with it. *C. furcatellus* occurs on Ben-a-Ghlo, and *C. cricellus* in shingly places near Forest Lodge. In this locality *cricellus* has the annoying habit of diving into the crannies amongst the loose stones, where it is impossible to get at it. Further up the glen, a form much smaller than the usual one of this moth occurs. This I was in hopes would prove to be another species ; but I cannot see any points of distinction except in the smaller size. Lower down the glen, the rather local *C. dumetellus* is not uncommon.

Of the *Tortricina* a good many species occur. *Tortrix icterana*, which is not a common Perthshire species, seems not very rare in one spot in the woods. *Amphysa germingana* is found on heathery banks ; and a few specimens of *Penthina marginana* have been taken. At an altitude of 2300 feet and upwards, *P.*

Staintonianc may be found, and is possibly not uncommon, but owing to the comparative rarity of suitable weather at that altitude, is not often taken. It occurs always amongst *Vaccinium myrtillus*, and has clearly no connection with *Arctostaphylos uva-ursi*, on which plant the larva was at one time supposed to feed. On Ben Chat the alpine *Sericoris irriguana* has been taken, while the commoner *S. cespitana* occurs in the glen itself. The handsome *Peronea maccana* has been taken by Sir T. Moncreiffe, amongst its favourite *Vaccinium Vitis-Idæa*. On Craig Urrard, near the mouth of the glen, the larvæ of *Euchromia flammeana*, and of the rarer *Coccyx finitimana*, may be found on the bearberry: the *Coccyx* also occurs at the back of Ben-a-Ghlo. *Cnephasia lepidana* is only worth noticing from the fact that, in apparently suitable places in the more lowland parts of Perthshire, it does not occur, while abounding in many parts of the Highlands, such as Rannoch and Glen Tilt. The great prize in this family in Glen Tilt is the beautiful silvery-white *Ablabia argentana*, which we were fortunate enough to discover (for the first time in Britain) in 1875. Till last season we thought that this moth was entirely confined to one very small spot, where certainly its headquarters are; but we have since seen it extending over about a mile of the glen, or more. When flying about the grass it is very conspicuous. Its flight is short, and from its habit of settling on the stems of the grass, it is easily seen and taken—though, from its pure colour, perfect specimens are rather scarce. On the hillside above Forest Lodge, at an altitude of from 1600 to 1900 feet, *Phoxopteryx lundana*, which otherwise is, in Perthshire, a not very common lowland species, occurs, along with *P. myrtillana*, which ascends still higher. Another scarce Perthshire species, *Olindia ulmana*, has been taken near Blair Castle. By far the most common species of this family in the glen is *Dicrorampha herbosana*, which abounds in grassy places near the Tilt.

Of the *Tineina* I cannot say very much, though many interesting species occur. The Lapland form of *Tinea rusticella*, known as var. *spilotella*, has been taken on Ben Chat, along with the usual form, while *Teichobia verhuellella*, which is one of the few British Lepidoptera that live upon ferns, was taken by Mr Herd near the Falls of Fender. *Incurvaria œhlmanniella* we find very rarely amongst *Vaccinium*, above 2000 feet—a curious place for rather a rare insect. Another insect not often found so high up is *Plutella cruciferarum*. This I have seen on other hills, and think that some other plants besides *Cruciferæ* must be eaten by

it. *Gelechia solutella*, *populella*, *galbanella*, &c., occur in various parts of the glen, and *Œcophora simulella* in the fir woods. *Saxifraga aizoides* being such a common plant, *Zelleria saxifragæ* of course abounds, living not only upon the above-mentioned saxifrage, but also on *S. oppositifolia*. From larvæ found on the under-side of the leaves of *Heracleum*, I reared some unusually dark specimens of *Chauliodus chærophyllellus*.

Of the "plumes," *Aciptilus tetradactylus* is excessively abundant, and *Pterophorus fuscus* and *plagiodactylus* occur here and there.

Two specimens of the rare *brachydactylus* have been taken near the mouth of the glen.

Of the other orders of the Insecta I will not on the present occasion say anything, but proceed to give a short account of the Mollusca of Glen Tilt.

MOLLUSCA.

The land-shells are chiefly interesting from the manner in which they are distributed in the glen. In many parts of the glen snail-shells are so rarely met with, that they become conspicuous by their absence. In other parts they are conspicuous for the very opposite reason, that they are so abundant as to compel observation. In no place can this be seen better than in the immediate neighbourhood of Forest Lodge; for there the river forms a sharp line of demarcation between ground swarming with shell-clad Molluscs and ground where scarcely a specimen can be seen. It would seem as if a devouring army of snails had marched over the hills from the south, till they had been stopped by the river. Though the stream would doubtless serve as an effectual barrier to the snails, if they depended on their own exertions to cross it, yet their stay on the south side of the valley at this spot is due to a very different cause. The south side of the glen here is composed of limestone, the north of gneissose or quartzose rocks. The plants of the south side provide the snails with abundance of that calcareous material, out of which their shells are made; the plants of the north contain little or no lime. And the same cause influences the distribution of the Mollusca in other parts of the glen, but in few places is it so markedly shown as at Forest Lodge.

Land Molluscs are notorious for their eccentricities of distribution—many species being limited to a single island, valley, or even to a single rock. The rich conchological fauna of the

Hawaiian Islands affords many notable illustrations of this. In these cases there is no doubt that other causes than the geological formation influence the distribution; but it is evident that the formation has no little effect upon the range of land Mollusca; and it is a cause that should not be overlooked, as it possibly is sometimes, in theorising on the subject.

In the richly-wooded and damp ravine that forms the lower part of Glen Tilt, Mollusca seem to be abundant. Perhaps the most interesting, as being rather scarce elsewhere, though abundant in this spot, and, moreover, a species whose centre of distribution seems to be, contrary to the usual rule, Western instead of Central or Eastern Europe, is *Helix fusca.*

Opposite Forest Lodge, on the calcareous slopes of Craig Mohr, Mollusca, as remarked above, abound. This was never more noticeable than on one wet afternoon, when, having nothing else to do, I climbed the very steep, nearly precipitous bank, that, to a height of about 600 feet, overhangs the Tilt at this place. I believe I do not overrate the number of snails when I say, that on an average every square foot of this slope had at least one snail upon it, and often two or three. All these snails belonged to two species, of which *Helix arbustorum* was very much more abundant than the other, *H. nemoralis.* I went over about half-a-mile of the bank, and as the snails were equally abundant everywhere, I am probably very much under the mark when I calculate the total number as about two millions. The slope continues to be of the same character for about a mile and a quarter, and there seems every probability that the snails were equally abundant over the whole of it, which would give a total of five or six millions of those two species. Most of the *Helix arbustorum* belonged to the variety *alpestris*, but some, though in size the same, have depressed (or rather, have not elevated) spires. Without exception, I think all the *Helix nemoralis* had yellow, unbanded, white-lipped shells, rather smaller than the usual var. *hortensis*, and approaching in size var. *minor.* In the ravine of one burn I found a few *H. rotundata*, but except in being a little smaller, the specimens do not differ from those found elsewhere. They occurred at an altitude of about 1750 feet, in company with *Zonites crystallinus*, *Z. nitidus*, *Z. alliarius*, *Vitrina pellucida*, *Helix concinna*, and *Limnœa truncatula.*

On some of the rocks, ascending to about 1600 feet, *Bulimus obscurus* was not uncommon. The shells are rather larger

than lowland Perthshire examples, and decidedly larger than English ones. On the same rocks *Clausilia perversa* was not uncommon. The specimens are chiefly remarkable for the ashy grey and weathered appearance most of them have. In size the majority are about that of the var. *Everettii*, but often more slenderly built. Some, however, are much like the ordinary form. A single specimen of *Carychium minimum* was found at about 1750 feet.

The slugs of Glen Tilt call for no special remark. *Arion ater* was, as usual, common in damp places on all the hills, and ascended to nearly 3000 feet.

The next part of this paper will be devoted to a consideration of the botany of the glen.

(*To be continued.*)

Additional Localities of Scotch Coleoptera.—

	District.
Dromius melanocephalus, Dej.,	Forth.
Anchomenus junceus, Scop.,	Do.
,, *scitulus*, Dej. (new for Scotland. Exact locality of capture unknown, probably Forth district),	?
Pterostichus minor, Gyll.,	Clyde.
Agabus striolatus, Gyll.,	Forth.
Lamprinus saginatus, Gr. (one specimen Dunbar Links, new for the East of Scotland),	Forth.
Philonthus scybalarius, Nord.,	Forth.
,, *fimetarius*, Gr.,	Forth.
,, *fulvipes*, Fab.,	Forth and Tweed.
Xantholinus ochraceus, Gyll.,	Forth.
,, *glabratus*, Gr.,	Forth.
,, *punctulatus*, Payl.,	Forth.
Sunius filiformis, Latr. (this is new for Scotland),	Forth.
Stenus pallipes, Gr. (also new for Scotland),	Forth.
,, *cinerascens*, Gr.,	Forth.
,, *impressus*, Gem. (new for Scotland),	Forth.
Trichopteryx lata, Mots.,	Forth.
Necrophorus interruptus, Step. (new for Scotland, one specimen),	Forth.
Melegethes æneus, Fab.,	Forth.
,, *viridescens*, Fab.,	Forth.
Triphyllus suturalis, Fab.,	Forth.

A. Buchan Hepburn, Junior Carlton Club, Pall Mall, London, *Jan.* 26, 1878.]

Short-sighted Policy.—I have before me vermin-lists from the following Scotch estates, which show a most extraordinary destruction of Hawks and other creatures believed to be inimical to the game. *Glengarry estate, from* 1837 *to* 1840. (Knox's 'Game Birds,' 115.) *Marquis of Ailsa's Ayrshire estate, from* 1850 *to* 1854. ('Birds of Sherwood,' 16.) *Breadalbane estate,* 1869 *and* 1870. ('Land and Water,' July 22, 1871.) These blood-stained rolls record the slaughter of 2642 individuals of the Hawk tribe, by which the Grouse may or may not have been benefited. That is an argument into which I will not enter. There is one class of feathered beings which undoubtedly reaped benefit from the slaughter—I mean the Wood-pigeons, which, from their enormous numbers and the harm they do, have become in some parts of Scotland an agricultural evil of no little magnitude.—J. H. GURNEY, jun., Northrepps, Norwich.

Guillemots colliding.—*Apropos* of my friend Mr J. H. Gurney's note on the collision in the Black Sea (*ante*, p. 198), I may mention that I witnessed a somewhat similar catastrophe in Loch Sunart in June 1876. I was on board the Lady Ambrosine, along with my friend Mr J. J. Dalgleish of Ardnamurchan, and we were steaming out of Loch Sunart on our way to Tyree. A flock of Guillemots (*Uria troile*) rose hurriedly to escape from the bow of the steamer. Two collided in their flight, and one fell head over heels into the water, as if shot, while the others pursued their course. Very much astonished was *Uria* when he came to his senses ; and I will not easily forget his puzzled appearance as he sat on the water twisting his head about, as if he had a crick in the neck.—J. A. HARVIE BROWN, Dunipace House, Larbert, *Jan.* 12, 1878.

VARIOUS NOTES.

That "union is strength" is self-evident, and consequently a combination of societies with similar objects is more likely to result in the general as well as the individual welfare of the societies than if each was to work, however energetically, alone. On this principle the Natural History Societies of Yorkshire joined themselves some time ago into an association which seems to work well, and combined to publish a monthly journal—'The Naturalist'—of which we gave a notice at the time. Following their example, the Natural History Societies and Field-Clubs of the midland counties of England have formed a union which bids fair to be very successful. They, too, have begun a monthly magazine, of which three numbers—printed and published at Birmingham—have appeared, under the editorship of Messrs E. W. Badger and W. J. Harrison, F.G.S. This magazine, to which the title of 'The Midland Naturalist' has been given, contains many interesting articles, and is well edited. Such signs of progress are gratifying to naturalists in every part of the country, and we have much pleasure in wishing our brethren of the midland counties all success.

PHYTOLOGY.

MYCOLOGICAL NOTES.

PTYCHOGASTER ALBUS.

By Rev. J. STEVENSON.

I cannot permit the following notes to appear without prefacing them by an expression of the deep emotion with which Mycologists would receive the announcement of the death of Professor Elias Fries. The close of his long and honoured life has left a blank which cannot be filled either for science or for memory. His own words, in concluding a letter shortly before his death, will find a response in the hearts of all to whom his name was familiar—

"Valeas, et me in amica memoria serves."

Ptychogaster albus is familiar to Mycologists; but, so far as investigations have extended, it remains a mystery in its origin and development. Fries, as is well known, long ago regarded this fungus as a degeneration of *Polyporus destructor*, but, till a comparatively recent date, there was no confirmation of this opinion.

I have watched the plant year after year (in one locality growing abundantly), and have never been able to observe affinity with the *Myxogastres* in the earlier stages of its growth. In the earliest stages in which I have observed it, it is soft; but its threads are never of the peculiar creamy consistence which is so distinctive a characteristic of the early growth of a true Myxogast. Nor, so far as I am aware, has anything similar to the peculiar development of the spores of a Myxogast been observed in *Ptychogaster*.

In 1874 I gathered specimens which bore unmistakable traces of the polyporoid form. These, however, were scarcely sufficient to warrant a conclusive opinion on the subject. In November 1877 I again gathered, in the same locality, specimens which combined more perfectly the characteristics of *Polyporus* and of *Ptychogaster*. Of these I forwarded specimens to the Rev. M.

J. Berkeley, whose opinion will be found recorded in the 'Gardeners' Chronicle' for December 15, 1877, p. 723. I sent specimens also to Professor Fries, who fully confirmed the conclusion that they represent *Ptychogaster* in true polyporoid form. He further informed me that he had gathered specimens of *Polyporus borealis*, which confirmed his views; and he pronounced the unqualified judgment — "Est itaque anomalum hoc genus delendum."

So far as regards the extinction henceforth of the genus *Ptychogaster*, the results of these discoveries are satisfactory. But in its origin and development this curious phase of fungoid growth remains an unsolved problem.

Fries, in his letter, speaks of *Ptychogaster* "in transitu ad Polyporos." His theory, therefore, would regard *Ptychogaster* as an arrest, so to speak, in the development of a *Polyporus*.

Mr Berkeley says: "It does not seem, however, that it is a degeneration of the *Polyporus*, but rather the work of a parasite, which modifies the matrix in the same way that *Nyctalis* and *Boletus* are affected by their peculiar parasites. The parasite, however, cannot be referred to the *Myxogastres*, nor do the threads seem to belong to the parasite, but to be derived from the matrix, just as those are which occur in *Ustilago olivacea*."

Mr Berkeley observes of the specimens which he received: "Before making a section, part of the specimen was seen to be in the usual condition of the *Ptychogaster*, consisting of erect irregular threads and abundant ochraceous spores, the other half exhibiting something like sinuous pores, but so soft and tender that it was difficult to say what their real nature might be. However, on making a section, not only was a white, firm base discovered, but pores in the normal condition of those of the *Polyporus* in question (*Polyporus destructor*)."

Among the specimens which I gathered there were some which, on the upper side, assumed the condition of *Ptychogaster*, while the under portion consisted of the normal pores of *Polyporus*, perfect in form, and pure white, even at the orifices. Some of these, however, after being gathered, soon passed into the condition described by Mr Berkeley when the specimens reached him. The pores in others remain more or less perfect at the orifices, though covered with the ochraceous spores. So perfect indeed were some of the specimens,—polyporoid on the under surface, ptychogastric on the upper,—that, at first sight, it might almost seem that a perfect *Polyporus* was passing into *Ptychogaster*.

Careful microscopic examination revealed nothing beyond the structure of normal pores of *Polyporus*, ptychogastric threads, and ochraceous spores.

These questions meanwhile remain for solution: "What is the nature of the structural transformation?" or, if the result of parasitic work, "Of what nature is the parasite?" One point only we may regard as conclusively determined—viz., that *Ptychogaster* must henceforth be deleted from the list of genera.

ON CERTAIN LICHENS BELONGING TO THE GENUS PARMELIA.

(*Continued from page* 203.)

By JAMES STIRTON, M.D., F.L.S.

Parmelia permutata sp. nov.—Thallus pallidus vel pallide glaucescens, lævigatus, lobato-divisus, subtus niger, ambitu pallide spadiceus, parce rhizinosus; medulla (parte supera) alba (C leviter erythrinosa), parte infera leviter flavescente (C flavente). Apothecia ignota.

Ad ramulos prope Brisbane (F. M. Bailey).

Parmelia platycarpa sp. nov.—Thallus flavescens vel pallide cervino-flavescens membranaceus, late expansus (K fl.) nonnihil rugulosus vel passim lævigatus, lobato-laciniatus, laciniis margine crenato-incisis vel sæpissime lacerato-dissectis, subtus niger, partim nudus partim nigro-rhizinosus, medulla alba (K flavente); apothecia magna (latit. 10-30 mm.) badio-rufa, receptaculo sessili vel sæpius subpodicellato, extus ruguloso vel foveolato-impresso: sporæ 8næ incolores, episporio crasso, .03-.037 × .012-.02 mm.; paraphyses non distinctæ in gel. firma involutæ. Iodo gel. hym. cœrulescens. Spermogonia extus nigra; spermatia recta cylindrica, circ. .006 × .0006 mm.

Corticola prope Brisbane (F. M. Bailey).

I consider this lichen distinct from *P. latissima* (Fée) in all its forms.

Parmelia cyathina sp. nov.—Thallus pallidus vel pallide cinerascens, passim sordide glaucescens, lævigatus, expansus, lobato-laciniatus, laciniis crenato-incisis vel sæpius lacerato

dissectis vel irregulariter dentatis (K flaventibus), subtus niger et nigro-rhizinosus; medulla alba (K—, dein C addito, leviter et sordide erythrinosa, sed C seorsum—); apothecia fusco-rufescentia vel badio-fusca, plerumque magna (latit. 3-20 mm.), receptaculo subpodicellato ruguloso et foveolato-impresso, margine sæpe lobatulo et basi sulcato; sporæ 8næ ellipsoideæ, sæpe gibbosæ, episporio incrassato, .028-.038 × .016-.02 mm. Iodo gel. hym. cœrulescens præsertim thecarum. Spermogonia extus nigra innata; spermatia cylindrica, sæpissime curvula, .005-.006 × .0009-.0011 mm.

Corticola prope Brisbane (F. M. Bailey).

This lichen seems allied to *P. nilgherrensis* (Nyl.), or rather to *P. macrocarpa* (Pers.), but the descriptions of these are deficient, and I have not seen authentic specimens of either.

Parmelia nigrescens sp. nov.—Sat similis *P. pertusæ* sed apotheciis nigris, vel cæsio-nigris et sporis (1-2)nis incoloribus demum fuscescentibus, ellipsoideis simplicibus, episporio incrassato, .04-.054 × .024-.038 mm. Iodo gel. hym. cœrulescens dein vinose fulvescens.

Supra lignum prope Wellington, N.Z. (J. Buchanan).

The epithecium in this section shows as a rufo-fuscous almost continuous layer composed of compacted cells. This may be a state of *P. pertusa*, and, if so, is very characteristic. Even the young apothecia are black. The thallus is pertused, and the white medulla is rendered yellow by K. The thecæ and spores seem to be ultimately tinted rufo-fuscous together, &c.

The *Parmelia* mentioned in the 'Trans. of the Glasgow Field Naturalists' for 1876-77, under the name *P. subæquans* (Nyl.), from the Cape of Good Hope, has peculiar spermatia, and is likely to prove distinct.

Parmelia toxodes sp. nov.—Sat similis *P. subæquanti* (Nyl.) sed thallo subtus toto pallido vel potius pallide lutescente etiamque rhizinis pallidis. Sporæ, .012-.016 × .007-.009 mm. Spermatia cylindrica curvula, .0045-.0055 × circ. .0008 mm.

Supra muscos prope Boschberg in Africa Australi, a cl. P. MacOwan lecta.

The spermatia are cylindrical, although when out of focus the extremities appear somewhat thickened.

I possess also another *Parmelia* from N.Z., which is more likely to be identical with *subæquans;* but as the spermatia in the latter have not been seen, the determination remains doubtful.

Parmelia subalbicans sp. nov.—Similis *P. subæquanti* sed thallo pallido vel pallide cinerascente et subtus pallido. Apothecia sicut in *P. subæquante.* Sporæ, .013-.016 × .008-.01 mm. Spermogonia extus nigra innata, peridio infra non infuscato; spermatia recta cylindrica, .007-.009 × circ. 0008. mm.

The reactions with C are the same in all these—viz., medulla C red. In the last from N.Z. the sorediiform points are few and scattered.

There is still another *Parmelia* in my herbarium of the type of *P. Borreri* sent by Mr Weir from the Brazils.

Parmelia flaventior sp. nov.—Thallus flavescens vel stramineus (C erythrinosus), subtus niger rugulosus fere nudus, laciniato-lobatus, laciniis rotundatis, margine passim adscendentibus, recurvis et tunc plerumque sorediosis, punctis vel fissuris sorediosis adspersis. Spermatia recta cylindrica, .0065-.008 × circ. .0006 mm. Apothecia ignota.

There are present, besides, rufo-fuscescent, generally conglomerate, cephaloid tubercles. The reaction by C on the white medulla, after the application of K, is intensely red, and the same intense red is immediately produced on the epithallus by the same reagents.

From Brisbane another *Parmelia* of the same type has been sent by Mr T. M. Bailey, which, as to external appearance, is unique; but inasmuch as both apothecia and spermogonia are awanting, its final determination must lie in abeyance.

(*To be continued.*)

Rosa micrantha in Scotland.—So far as I am aware, this Rose has not previously been found further north than Bilton, near Alnwick, in Northumberland, where it was discovered about ten years ago by Mr Chrisp. I inclose examples from three Scottish stations—two in Roxburgh, and one in Berwickshire. None of them agrees exactly with any of the southern forms that I have seen; that from the hedge or roadside near Muirdean, Roxburgh, is the most characteristic. The other two—from "roadside between Kelso and Yetholm, Roxburgh," and "roadside to Nenthorn, Berwickshire"—recede from the type, in the prickles not being uniform, the hairy styles, the more rounded base of the leaves, and in the general habit of the plant, which is more compact, and the branches not so lax and flexuous as in typical *micrantha.*—Andw. Brotherston, Kelso.

Xylaria polymorpha.—This fungus, though rare in Scotland generally, appears to be frequent in Roxburghshire, as—although not searching for fungi

—I saw it during the past year, in three widely-separated localities, in the same sort of habitat in each case—in woods on the decayed stumps of felled trees. The localities were—Roxburgh Barnes, Riddell, and Harpertoun.—ANDW. BROTHERSTON, Kelso.

New Scottish Fungi.—In the 'Annals and Magazine of Natural History' for January, Messrs Berkeley & Broome give a new instalment of their "Notices of British Fungi." As Mr Stevenson will, it is to be hoped, be able soon to publish his catalogue of Scottish Fungi, we need not do more than mention the names of the new additions to our Scottish list: some of these, it will be seen, have already been noticed in this Magazine. Mr Stevenson's additions to the list are as follows: *Agaricus magnificus*, Fr.; **A. hæmatites*, B. and Br.; *A. cerinus*, P.; *A. zephirus*, Fr.; *A. amictus*, Fr.; *A. striæpileus*, Fr.; *A. pictus*, Fr.; *A. æthiops*, Fr.; *A. dulcamarus*, P.; *A. Trinii*, Wein; *A. cupularis*, Bull; *A. scobinaceus*, Fr.; *A. sphinctrinus*, Fr.; **Hygrophorus pulverulentus*, B. and Br.; *H. subradiatus*, Fr.; *H. glauco-nitens*, Fr.; *Russula semicrema*, Fr.; *R. xerampelina*, Schæff.; *R. consobrina*, Fr.; *Marasmius torquescens*, Quélet; **Porothelium Stevensoni*, B. and Br.; **Hydnum limonicolor*, B. and Br.; **H. multiforme*, B. and Br.; *H. nodulosum*, Fr.; *Grandinia crustosa*, Fr., var. *lignosa; G. mucida*, Fr.; **Cladoderris minima*, B. and Br.; *Corticium cinnamomeum*, Fr.; *C. violacea-lividum*, Fr.; **Glæosporium violæ*, B. and Br.; *Stysanus putredinus*, Ca.; **Stilbum Stevensoni*, B. and Br.; **Dactylium cervinum*, B. and Br.; *Mucor stolonifer*, Ehrb.; *Eutypa aspera*, Fr.; **Sphæria Stevensoni*, B. and Br.; **Ascochyta metulæspora*, B. and Br.; making in all thirty-seven species, of which eleven are new to science, and showing that Mr Stevenson is as indefatigable an investigator as ever. Mr Keith seems to have exhausted the *Agaricini* of his district, as most of his discoveries are in other families, as will be seen from the following five species, of which three are new to science: *Panus patellaris*, Fr.; *Polyporus leucomelas*, Fr.; **Porothelium Keithii*, B. and Br.; **Stilbum orbiculare*, B. and Br.; **Diatrype coramblycola*, B. and Br. Since Mr Anderson left Menmuir, he has neglected the Fungi in favour of another order, so that only three species (of which two are new) fall to his share: *Agaricus ammophilus*, Mont. and Dur.; **Cyphella stuppea*, B. and Br.; **Protomyces comari*, B. and White. Other species noticed are *Agaricus Vahlii*, Schum., at Dunkeld, by Mr C. M'Intosh; **Porothelium confusum*, B. and Br.; Glen Tanner (collector not mentioned); and *Isaria sphingum*, Schw., in Kincardineshire, by Mr Taylor. To my own share, seventeen species (five new) fall: *Agaricus plicosus*, Fr. (also found by Mr Stevenson subsequently); *A. umbilicatus*, Schæff.; *A. reniformis*, Fr. (also found by Mr Stevenson); *A. nigrella*, P.; *A. thraustus*, Kalkb.; *Hygrophorus cinereus*, Fr.; *Marasmius scorteus*, Fr.; *Corticium citrinum*, P.; *C. limitatum*, Mont.; **Typhula gracillima*, White; **Bactridium acutum*, B. and White; *Cylindrosporium longipes*, Preuss.; **Milesia polypodii*, White (by some *lapsus calami* this appears in the "Notices" as *M. polygoni*, and the habitat of No. 1717, *Dactylium spirale*, is given for it); **Dactylium spirale*, B. and White; **D. modestum*, B. and White; *Helvella atra*, Kön.; *Sphæria maculans*, Desm.

Ninety-nine new British species in all are given in the "Notices," of which no less than sixty-five are from Scotland. Of the twenty-nine species new to science, twenty-two are Scottish. These are indicated above by having an * affixed.—F. BUCHANAN WHITE.

GEOLOGY.

THE GOLD-FIELD AND GOLD-DIGGINGS OF CRAWFORD-LINDSAY (LANARKSHIRE).

By W. LAUDER LINDSAY, M.D., F.R.S.E., F.L.S.

(*Continued from page* 214.)

I THOUGHT it right, in the last number of the 'Scottish Naturalist,' in describing the gold-field and gold-diggings of the Crawford-Lindsay district of Lanarkshire, to confine myself to their *present condition and modern history*, believing that these would have more of an immediate interest to all students of the natural history of native gold in Scotland than their ancient or medieval history. But I mentioned at the same time that, in many respects, the *ancient history* of these diggings is much more important, instructive, and suggestive, than that which is modern; and the correspondence I have had since I committed to paper what I had to say regarding the present condition and prospects of the Crawford-Lindsay gold-field leaves me in no doubt that there are certain circumstances brought out by that ancient history that have the most intimate bearing on current researches—not mineralogical or geological only, but also historical, archæological, and numismatological.

Of these points of interest, the most important I believe to be the evidences that present themselves showing that what have been described since the year 1125 as "gold-mynes" in Scotland refer merely to *surface diggings*, to the sinking of pits or shafts in superficial drifts, to the washing of the clays, gravels, or sands that form the beds, haughs, or terraces of streams, or that cover the flanks of hills.

There are evidences also of *mining proper*—of the working and crushing of *auriferous quartz;* though these evidences are neutralised—to a certain extent, if not altogether—by certain counter-

assertions that no such auriferous quartz exists, no "vaines," or "seames," or "bedds" of gold or gold quartz—no gold in "solid places."

Whatever, however, has been the nature of the "gold-mynes" of, and gold-mining in, the Crawford-Lindsay district in and since the sixteenth century, there are many curious evidences of the *quantity* of gold found, and of its *value* in the current coin of the realm.

It is impossible to understand or appreciate fully the nature of the evidences as to either the character of the gold-mining, or the amount and value of the produce, without a brief chronology and history of the principal gold-mining operations and operators. In order that those specially interested may consult the various works that contain histories of the discoveries, workings, speculations, and speculators of Crawford-Lindsay, showing the nature and amount of public attention they attracted in the reigns, especially, of the three Jameses (IV., V., and VI.), I have appended a short *Bibliography*, because it would obviously be improper to occupy the space of the 'Scottish Naturalist' with recapitulations or quotations from accessible published works.

My main object at present is to point out how it is that historians and archæologists, as well as mineralogists and geologists, have allowed themselves to be misled by the incessant use of the term "mynes" (instead of "washings" or "diggings") in all documents, scientific or general, connected with the development of actual or possible gold-fields in Scotland during the last seven centuries. But a preliminary knowledge of at least the following dates, names, and facts, is either desirable or indispensable to a consideration of the nature and extent of gold-mining in Scotland in the olden time:—

I. *Reign of James IV.:* years 1511 to 1513.—"The business of gold-seeking under the auspices of the Scottish Government seems to have commenced about 1511." We hear of a gold-"myne at Crawford Moor," first at Leadhills, and then at Wanlockhead, in 1512 (Fittis).

II. *Reign of James V.*—In 1524 a medal was struck in Crawford Moor gold by the Duke of Albany as Governor of Scotland (Patrick). A Crown lease was granted of the Crawford Moor gold-mines in 1526 to a company of *Dutchmen*, who sent at least a portion of the "ore" procured to Holland "to be refined" (Calvert). "Gold of the mynde" (or mine) was used at the Scottish mint in Edinburgh for the coinage of unicorns in 1517-18 and

1524-26 (Patrick); and of *bonnet-pieces*,[1] subsequently known as ducats, in 1539-42. At this period the mines were first worked by a company of *German* miners, by whom the "ore" was sent to Germany to be "refined;" and subsequently (1539-42) by a body of *French* miners. The Crawford gold was now spoken of as "the king's own gold," and the king was very proud of it. He showed this pride in various ways. In the first place, he took his second queen—Mary of Guise—personally to visit the district; and in the next, it was at his marriage-feast with this queen in France that he caused to be placed before each guest a vessel full of bonnet-pieces, minted in his own Scotch mint of Crawford gold, telling the assembled company "that these were the choice fruits which grew in his country."[2] He also sent a piece of unmolten or "unwrought gold of the myne" as a present to his father-in-law, the Duke of Guise, in France (Fittis). Moreover, not only were the Queen's crown, a belt, and no doubt other ornaments, made of this "gold of mynd," but the arches of the king's own *crown*—the present crown of Scotland, as preserved in Edinburgh Castle, which additions were made by the king himself—were manufactured of his "own gold," so that they "may be regarded as composed of genuine Scottish gold of the mine" (Fittis).

III. *Reign of James VI.*—In 1567-68, *Cornelius de Vois, a Dutchman*, got a nineteen years' licence to work the Crawford mines. He raised a joint-stock company, with a capital of £416, employing 120 men and women. He was commissioned by London merchants, during the reign of Queen Elizabeth, to "discover the gold *vein or bed*" (Calvert), which was supposed to be the source of all the Crawford gold. He was followed by another Dutchman, *Abraham Grey*, better known as "Greybeard," who is the hero of another "tradition," comparable with that of the bonnet-pieces, and which may be quite as veracious, or the reverse. In his case, what figures is a *golden basin* filled with gold coins (*unicorns*), both being made of Crawford gold; the said cornucopia

[1] So called "from the capberet or bonnet which James V. wears in his portrait on the obverse of this coin" (Fittis); that bonnet probably which the king delighted to wear at Stirling in his capacity of the "Gudeman of Ballangeich."

[2] Various other versions of this story are given, including the "tradition" which assigns the place of the incident to Crawford Castle, and describes the magnates who were astonished by the nature of the dessert presented to them as the French ambassadors, who were hunting with the king as his guests in the said castle (Porteous). Calvert speaks of "covered cups filled with native gold" being presented "as specimens of Scotch fruit."

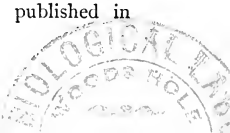
being presented to the French king by the Regent Morton (Fittis). Grey was followed, in his turn, by an *English* adventurer, *George Bowes*, whose operations were most important, in so far as he is the first who is said to have found gold quartz *in situ*—in a *vein*—at Wanlockhead. He sunk a shaft, or shafts; but "when he and his men had filled their purses, then he caused the shaft to be filled up again, swearing his men to secrecy," these men being "both English and *Scots* workmen" (Fittis). We are told that he erected a *stamping-mill* on the Longcleuch head—a circumstance whose significance will form the subject of special remark further on. He was to have returned next year to Scotland "to seek for a greater vein," but died by an accident in the interval. Another speculator, a foreigner, *Hochstetter*, "had certain intelligence of the vein"—that is, no doubt, heard of its discovery, and made search for it, but failed to find it; and the same unsuccess appears to have attended the many other mining authorities, who afterwards made the most anxious search for Bowes's shaft and vein. And yet Dr Porteous speaks of its locality being known to the Wanlockhead miners of the present day.

In 1576 "an unquestionable proof that quantities of gold continued to be gathered in Scotland is furnished by an Edict of the Privy Council," which "forbade the gold-seekers in Crawford, Roberton, and Henderland to sell their gold, as they had been doing, to merchants, for exportation, and ordained them to bring in all . . . to the King's Cunzie House" (the Royal Mint at Edinburgh), "there to be sold at the accustomed prices for the use of the State" (Fittis).

In 1592 the king appointed a Mr *John Lindsay* to the new office of "Master of the Metallis" in the Scottish Mint. The new master was one of the Edzell (Forfarshire), not the Crawford (or Lanarkshire) Lindsays, who afterwards became successively one of the Lords of Session, as Lord Menmuir, Lord Privy Seal, and Secretary of State. He was father of the first Lord Lindsay of Balcarres. With his elder brother, Sir David Lindsay of Edzell and Glenesk, he took an active interest in the discovery of gold, in what has been aptly called the "Land of the Lindsays,"[1] in Forfarshire, where, too, it is of interest to note, gold mines were successfully worked for a long series of years.

In 1593 or 1594, to *Thomas Foulis*, an Edinburgh goldsmith, was granted by the king a twenty-one years' lease of the gold

[1] The title of a book by Andrew Jervise, F.S.A. Scot., published in 1853.



and other mines of "Crawford moor and Glengonar." Foulis became permanently connected with the district, in which he purchased property; for his granddaughter Annie, heiress to his territorial possessions here, marrying into the Hope family, her grandson was, in course of time, the first Earl of Hopetoun, while the present Earls of Hopetoun are proprietors of the Lanarkshire portion of what in the sixteenth century acquired the name of the "golden area" of Crawford.

Then we come in 1594-97 to the originator and Grand-master of the order of the "Golden Knights," or "Knights of the Golden Mines"—*Sir Bevis Bulmer*, an Englishman, one of the most famous of the mining engineers, or mineral surveyors, whose duties or whose interests called them to the Crawford district in olden times. In various forms he has made and left his mark permanently on the district, like Foulis, whom he joined in partnership. He built a fine mansion-house in Glengonar; and one of the heights above its former site "still bears the name of Bulmer's Hill;" while there is also in the district a "Bulmer moss" (Porteous). The vestiges of old gold-workings in the Longcleuch, at the locality still called the "Gold Scours,"[1] are also said to have been those of Sir Bevis (Calvert); while "a row of houses in Wanlockhead, termed the 'Gowd Scar Row,' are monuments of these enterprising works of the sixteenth century" (Porteous). Bulmer was so high in favour with Queen Elizabeth that he was appointed by her Master of the Mint, presumably of England. Whether in gratitude, or to gain her favour, he presented to her a *gold porringer* made of the produce of his Crawford workings (Calvert).[2] Bulmer had a *Stamping-mill* erected at the head of the Longcleuch Burn—a tributary of the Shortcleuch—for he had found there "the little string or vein powdered with small gold" (Porteous)—that vein apparently which had been first discovered by Bowes. What Atkinson tells us, however, is this: "*Some say* that he also found out the *Suspected Vaine* of gold which Mr Bowes had discovered." Bulmer wrote an unpublished—that is, a MS.—book on his mining experiences, entitled 'Bulmer's Skill;' and it was it that led the king to propose the creation of a Speculative Company of Golden Knights (Cal-

[1] This designation, however, would appear to be borne by more than one locality in the district; for Dr Porteous tells us that "mounds of rubbish on the Elvan or Shortcleuch are still called the Gowd Scars."

[2] Another version of the story being that he "presented as much gold as made a porringer" (Fittis).

vert).[1] Well says Bulmer, after all his vicissitudes of fortune, "Mines are as uncertain as the life of man, which is like a bubble on the waters to-day—to-morrow none." Lavishly liberal—"such as he was most liberal to were readiest to cut his throat"—

> . . . . "When gold lay hid and unto us unknown,
> Of strife and debate the seed was unsown;
> Then lived men well, and held themselves content
> With food and clothes, and payed then no rent."

Such is Atkinson's moralising over the rise and downfall of his friend and master, the once princely Bulmer. Bulmer's reign appears to have been the golden age of the "golden area" of Crawford-Lindsay. During the sovereignty of his patroness, Queen Elizabeth, Scotland was considered an *El Dorado*, and Crawford as the El Dorado of Scotland—in very truth man's, if not also God's, "Treasure-House" there.

We come now to *Atkinson* himself, who was taught mining by Bulmer, by whom he was brought to the Leadhills in search of a "vein" of gold or gold-quartz—in all probability that vein found, or reported to have been found, by Bowes. He tells us himself that his great aim in coming to Crawford was "that great blessing of God, . . . even that *bedd or vaine* of gold and silver myne." He held a Royal warrant as a gold seeker and worker there of "mynes, seames, and mineralles" of gold and silver, "to searche, seik, worke, dig, try, discouver, and find out" all about them; and he obviously regarded himself as a "moyner and pioner"—in modern parlance, a "prospector" and "digger." His operations, of whatever nature they were, do not appear to have been successful. At all events his fame rests on his book, published in 1619, which has been a "digging," "a Treasure-House," for all subsequent writers on the gold fields or mines of Scotland. It was he who introduced the phrase "God's Treasure-House"[2] in Scotland as applicable to the Crawford district, and who first drew a parallel between its four chief streams and the four rivers of Eden. In his own words: "Prudent men . . . compared those Scotts gold-mynes unto God's

[1] Atkinson speaks of this scheme as a Royal "plott"—a device of the king's; and in all probability Bulmer himself gave the king the credit of it. But Bulmer himself was nevertheless its probable projector, as he was one of the only two persons who benefited by it.

[2] A title adopted by Dr Porteous for a recently-published work mentioned in the Bibliography.

Treasur-House, placed by God Himselfe within the centur of the earth. . . . But others . . . will not be perswaded that any goodnes can be produced out of Scotts ground, and are doubtfull whether the sonne and moone and starrs shine there or not."

In 1621, a Royal warrant or licence was granted to *Dr John Hyndlie*[1] to work "his Majestie's mines of gold within the bounds of Crawford Moor, Frier Moor, Crawfordjohn, Robert Moor," and other specified localities (Porteous). How long his operations lasted, and what was their nature, does not appear. But since this date, there would seem to have been no systematic working of the Crawford gold-fields or gold-diggings. The gradual failure of these diggings was probably coincident with, or dependent upon, and in proportion to, the gradual increase in the value of labour. But between 1511, when we first hear of the "gold-mynes" of Crawford, and 1621, when we hear of them for the last time—as being worked, at all events, systematically or on the large scale—the workings, on whatever scale, whether by Dutch, German, French, English, or Scotch miners, and of whatever nature their operations were—whether alluvial-washing or quartz-crushing—were repeatedly suspended and resumed; the reason of these vicissitudes in their history being easily found in the disturbed state of the country, the deaths of kings, and the losses in battle with the English, as well as the failures, temporary or permanent, of lessees, or the local unproductiveness of the mines themselves.

In the *seventeenth century*, Charles I. had his coronation-medals struck of Crawford gold; while Sir Hans Sloane, the well-known founder of the British Museum, had a medal made of it (Calvert).

In the *eighteenth century*—about 1740—Sir John Erskine and others had "a plan for working the Clydesdale mines again" (Calvert); but it does not appear that this "plan" was ever carried into effect. In the reign of "George III., in the present *nineteenth century*, the working of the Clydesdale gold was attempted to be resumed under the superintendence of the manager of the lead-mines at Wanlockhead; but the price of labour was considered too high to induce the continuance of the working." This is "the last account we have of the working of the Clydesdale mines" (Calvert).

It is now desirable to arrive at some idea of, or conclusion con-

[1] Or Hendlie, as Calvert calls him. Calvert does not adhere, in his quotations from Atkinson or the Cottonian MSS., to the old orthography, as Fittis and Dudgeon very properly do.

cerning, the *productiveness* of gold workings that, in the reign of Queen Elizabeth, had not only an English but a European reputation (Calvert). It is, however, impossible to arrive at anything like an estimate that can be depended upon. The evidences of their productiveness are very vague and unsatisfactory. But such as they are, it is necessary to describe them, so that each reader may judge for himself what value is to be attached to them. These evidences, then, include the following:—

1. The production, in the reign of James V., of a new gold coin—the finest of the Scottish coins — the *Bonnet piece*, from Crawford gold.

2. The gift of platefuls of these coins to his marriage-feast guests by the same king.

3. The use of the same native gold in making additions to the *Regalia*—the Scottish crown: still by the same king.

4. His employment of it also in making his second queen's crown and other of her ornaments.

5. The presentation of a *gold basin* full of *unicorns*—both of Crawford gold—by the Regent Morton to the king of France.

6. The prohibition in 1576 of the export of Crawford gold.

7. The enrichment of Foulis and Bulmer.

8. Bulmer's presentation of a *gold porringer* of Crawford gold to Queen Elizabeth.

9. The fame that the Crawford region had by this time acquired as a "golden area" and as "God's Treasure-House" in Scotland.

10. The number of miners employed at various times—Dutch, German, French, English, and Scotch—and their prosperity.

11. The statements made by Atkinson, the Cottonian Reporter, or other writers, as to the value of the gold coined, or otherwise made use of in its molten and wrought condition.

So early as the reign of James V., according to the Cottonian Reporter, no less than 300 persons maintained themselves by washing gold; and he speaks of the *annual value* of the yield of the district for eighty years having been upwards of £100,000 in money of that time (Calvert). What is the precise equivalent of such a sum at the present day I am not in a position to say. But Mr Patrick tells us, in his standard work on the Scottish Coinage, that in 1503 one pound *Scots* was only one-third the value of one pound sterling *English:* in other words, that £6000 Scots equalled at that time only £2000 sterling English. This disproportion subsequently became much greater, however—just four times as great; for we are told that on the accession of James

VI. to the English throne, "the relative value of English and Scottish coins was declared to be as 12 to 1."[1]

The 'Miscellanea Scotica' states, on the authority of a Biography of James V., published at Paris in 1612, that the Crawford gold-mines, while worked by the Germans, "afforded him *great sums.*"

Devois in the reign of James VI. "had six score men at work in valleys and dales. He employed both men and women, lads and lasses, who before begged. He profited by their work, and they lived contented and well. . . . In thirty days' time they conveyed [to the mint at Edinburgh] half a stone weight of natural gold, worth £450 sterling" (Atkinson). The wages of the gold seekers or washers were at this time very low, though remunerative; for Greybeard, we are told, "hired many inhabitants at *four pence per day*, which contented them as twelve pence did the English" (Atkinson).

In 1591, no less than £38,000 worth of gold from Crawford Moor was ordered to be coined, according to Calvert, quoting Atkinson. But he does not explain whether this large sum represents Scotch or English money of that time, or of the present day. The same dubiety attaches to Calvert's estimate of the aggregate value of the "total produce" in gold of the Crawford mines from times anterior to the reign of James IV. till 1853, the date of his own book, which value he puts in figures at £515,000. "Early periods," prior to the time of James IV., yielded, according to him, £50,000 worth of gold; but this sum and this yield are obviously more than problematical. Then he assigns £1000 worth to *Lesmahagow*, which is not in the district, and which probably never yielded gold at all. Next he assumes an annual income of £300 from 1580 to 1780, a period of 200 years: while he estimates the produce from 1780 to 1853—arbitrarily, of course —at £4000. It is impossible to accept this or any such *estimate* of the value of the produce of the Crawford diggings. But if we chose to assume the probable greater correctness of the Cottonian Reporter, and take his word for it that £100,000 worth of gold was turned up and out annually for eighty years, we have at once a grand total of eight millions worth of gold produced during portions of the fifteenth and sixteenth centuries —which sum, at the then probable value of Scots money, was equal to more than two and a half millions sterling English.[2]

[1] Chambers's Encyclopædia, art. "Numismatics."

[2] This amount is not, however, great when compared with the gold-prod-

Bibliography: Illustrative of the History of the "Gold-mynes" of, and of Gold-mining in, Crawford-Lindsay, from the sixteenth century downwards.

I. Report on the Gold-mynes of Scotland: in MS. in the *Cottonian Collection* of MSS. in the library of the British Museum.

The fragment of MS. descriptive of the gold-mines of Crawford Moor—the only gold-mines then known in Scotland—is undated and anonymous. But it is obviously referable to the sixteenth century, and it is written by a competent authority who had been specially commissioned to survey or prospect, and report upon the auriferous capacity of, the Crawford-Lindsay district. Up to the present date it remains the most important report that has ever been made on the gold-field and gold-diggings of that "golden area." The MS. has been quoted by Calvert, Dudgeon, and Porteous; most fully by the first-mentioned writer, by whom it was for the first time made known to the public.

II. The Discouverie and Historie of the Gold-mynes in Scotland. By *Stephen Atkinson.* Originally published in 1619: best known as edited for the Bannatyne Club by Gilbert L. Meason in 1825.

As indicating the value now attached even to this modern edition of Atkinson's work—of which only fifty-two copies were printed—it may be mentioned that at the sale by auction in London, in February 1874, of the library of the late Rob. Nasmyth, F.R.C.S.E., of Edinburgh, as much as £11, 10s. was given for a single copy.

Atkinson was one of the pupils, and then copartners of, and mining managers for, the noted gold-speculator Sir Bevis Bulmer; having previously been—in 1586—gold and silver refiner in the Mint of the Tower of London. In 1616 he succeeded, by a Privy Council Act in his favour, to Bulmer's post at Crawford Moor, Bulmer having died in 1613.

The book was written for the purpose of keeping up the interest of the king (James VI.) in the gold-mines belonging to him in the Crawford Moor district; and hence it is drawn up in

uce of other auriferous countries. Thus the 'Statistics of New Zealand' for 1876 (the latest published) show that since 1857 the "value of gold entered for duty for exportation alone" has been no less than upwards of thirty-two millions in less than twenty years.

the high-flown language of courtiers of the day—his royal patron being compared in it to Kings David and Solomon, while the mining region itself was likened to the Garden of Eden.

III. Brief Historical Account of the Mines of Wanlockhead. By the late *Dr Watson*, of that village.

IV. Caledonia: an Account—historical and topographical—of North Britain. By *George Chalmers*. 4 vols., 4to. 1807-1824.

V. The Lives of the Lindsays: a Memoir of the Houses of Crawford and Balcarres. By *Lord Lindsay* (now the Earl of Crawford and Balcarres). 2d edition, 3 vols. 1858.

VI. The Gold-rocks of Great Britain and Ireland. By *John Calvert*, mining surveyor (from Australia). 1853.

It contains chapters on the "History of Gold in Scotland" and on "The Gold-fields of Scotland."

I know that this book has long been looked upon with disfavour both by mineralogists and miners in Scotland—for various reasons, and among others, the alleged fanciful views and inaccuracies of its author. But there is no gainsaying that he has brought together a large amount of information concerning the gold "mynes" of Scotland, and has enabled us to compare them and their produce with gold-workings in other auriferous countries. He cites, moreover, his authorities, who can be consulted at first-hand by those who wish to estimate the authenticity of the statements made by old chroniclers. With all its imperfections —whatever these may be—Calvert's work contains the fullest and best account we yet possess of the Scottish gold-fields and gold-diggings. He gives copious quotations from the Cottonian MS. of the British Museum, as well as from the quaint old work of Atkinson—extracts more copious by far than those given by any other writer either before or since the date of his work. Thus he quotes from Atkinson both in the original and as printed by the Bannatyne Club. And these quotations alone would render Calvert's work the most important that has yet appeared on the gold-fields, gold-mines, and gold-diggings of Scotland.

VII. Illustrations of the History and Antiquities of Perthshire. By *Rob. S. Fittis*, of Perth. 1874.

Five of its chapters relate to "The Search for Scottish Gold in Olden Times;" and this account of the ancient gold "mynes" of Scotland is at once the fullest, most accurate, and most modern with which I am acquainted.

VIII. God's Treasure-House in Scotland : a History of the Times, Mines, and Lands in the Southern Highlands. By the *Rev. Dr Porteous*, of Wanlockhead. With Geological Map by Knipe, and woodcut illustrations by Dr Porteous himself. 1876.

There is a special chapter on "Gold and Gold-finders," embodying the results of the author's own inquiries during a residence of nine years in the very centre of the Crawford-Lindsay gold-field.

On the map, Mr Knipe has shown, as he has done in the last edition (1875) of his "Geological Map of the British Isles," the chief *localities* of gold finds and workings in the Crawford-Lindsay district.

IX. Historical Notes on the occurrence of Gold in the South of Scotland. By *Patrick Dudgeon*, F.R.S.E., F.S.A. Scot. A 4to pamphlet, printed in 1875 for private circulation, and for the purposes of a bazaar at Glasgow in aid of Miss Clugston's Home for Incurables.

Its most noteworthy feature is the *frontispiece*, a beautiful coloured lithograph of the *Gemmell quartzite*, bearing the title "Auriferous quartz—actual size—found at Wanlockhead by Andrew Gemmell, miner, in 1872."

What appears to be virtually the same pamphlet—minus the plate, and with sundry alterations in the text—was published as a paper, with the same title, in the first number of 'The Mineralogical Magazine' for August 1876.

X. Paper on the Silurian Rocks of the South of Scotland : and on the Gold Districts of Wanlockhead and Leadhills. By *Professor Harkness*. In the 'Quarterly Journal of the Geological Society,' vol. viii., p. 396. 1852.

XI. History of the Upper Ward of Lanarkshire. By *G. Vere Irving*, F.S.A. Scot., and *Alexander Murray*. 3 vols. 1865.

XII. The following works by *R. W. Cochran Patrick*, F.S.A. Scot.

(1.) Records of the Coinage of Scotland, from the earliest period to the Union. 2 vols. 1877.

(2.) Notes on the Annals of the Scottish Coinage. Communicated to the Numismatic Society of London in 1873.

(3.) Records of Mining in Scotland. 1878.

XIII. The following Contributions to the Social and Natural History of the Gold-fields and Gold-diggings of Scotland, by *the author*.

(1.) The Gold and Gold-fields of Scotland. Transactions of the Edinburgh Geological Society, vol. i. 1868.

(2.) The Gold-fields of Scotland: with map and other illustrations. Journal of the Royal Geological Society of Ireland, vol. ii. (new series). 1869.

(3.) The Gold-fields of Scotland. Report of the British Association meeting at Dundee in 1867.

(4.) The Gold and Gold-fields of Perthshire. Proceedings of the Perthshire Society of Natural Science for 1870.

(5.) Recent Gold Discoveries in Scotland. Reprint from the 'Perthshire Constitutional' of February 18, 1874.

(6.) The Auriferous Quartzites of Scotland. Reprint from 'The Scottish Naturalist' for April 1875.

XIV. *Geological Map* of the British Isles. By *J. A. Knipe*, Associate of the Geological Society of Edinburgh. Revised edition of 1875.

Distinguished from all other geological maps of Scotland or Britain by its laying down the *localities* of gold-diggings, gold-finds, and gold-fields, both in the northern and southern Highlands of Scotland.

Native Gold in Perthshire.—The following interesting note on certain limited "diggings," long ago conducted at Lochearnhead, under the auspices of the late enterprising Marquis of Breadalbane, was sent to me by Mr Ritchie, C.E., Perth. The writer of the note itself is Miss Stewart, of Ardvorlich, on Lochearnside, and what she says is this:—

"Some gold was found in the neighbourhood—on the Breadalbane property—on the hillside near the railway station at Lochearnhead, where an excavation was made and was worked for some time. But as the small quantity of gold found was not likely to be remunerative, the working was given up. It was in the late Marquis's time; and he spent much money in trying to find minerals of all kinds on his estate, having in his employ an experienced mineralogist."

All such accounts of former gold-digging in Scotland are worthy of record, especially in connection with the general interest presently existing on the subject; and it is in the hope that my example may be followed by others who may be in possession of authentic and unpublished information concerning gold-finding or gold-working in any part of Scotland, that the present note on a small experimental Perthshire digging, undertaken by a nobleman who displayed great mineralogical enterprise, has been contributed to the 'Scottish Naturalist.'—W. LAUDER-LINDSAY, Gilgal, Perth.

INSECTA SCOTICA.

THE LEPIDOPTERA OF SCOTLAND.

(*Continued from page* 223.)

EDITED BY F. BUCHANAN WHITE, M.D., F.L.S.

SUBFULVATA Hw. Not common. Pascual.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway ♀ ♀ ♀ o

LAT. 54°40′-57°40′. RANGE IN EUROPE. Central, &c. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. August, September. FOOD-PLANT. Yarrow (*Achillea millefolium*).

The ab. *oxydata* L. has occurred in Tay and Solway.

SCABIOSATA Bkh. (1794); *subumbrata* Gn. Rare. Pascual. Ascends to 1200 feet.

DISTRIBUTION—EAST. o o o Dee o o o o o
WEST. o o o o o o

LAT. 57°20′. RANGE IN EUROPE. Central; Finland, &c. TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June. LARVA. August, September. FOOD-PLANT. Flowers of low plants.

NANATA Hb. Common. Ericetal. Ascends to 3800 feet.

DISTRIBUTION—EAST. Forth Tay Dee Moray ♀ Orkney ♀
WEST. Solway Clyde ♀ West-Ross ♀

LAT. 54°40′-59°10′. RANGE IN EUROPE. Central. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. August, September. FOOD-PLANT. Heather (flowers).

FRAXINATA Crewe. Rare. Nemoral.

DISTRIBUTION—EAST. ♀ Forth [Tay] o o o o o
WEST. o o o o o

LAT. 56°. RANGE IN EUROPE. Britain, W. Central Germany. TYPE. Occidental. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August, September. FOOD-PLANT. Ash (leaves).

PYMÆATA Hb. Rare. Pascual?
DISTRIBUTION—EAST. ♀ Forth Tay o o o o o
WEST. ♀ Clyde o o o
LAT. 55°40′-56°30′. RANGE IN EUROPE. Britain, Holland, Belgium, Finland, Lapland, &c. TYPE. Occidento-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June. LARVA. Aug. and Sept. FOOD-PLANT. ? *Stellaria holostea* (flowers and seeds).

TENUIATA Hb. Common. Nemoral. Ascends to 1400 feet.
DISTRIBUTION—EAST. Tweed ♀ Tay Dee Moray ♀ o o
WEST. Solway ♀ ♀ ♀ o
LAT. 54°40′-57°40′. RANGE IN EUROPE. Central. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. July. LARVA. April, May. FOOD-PLANT. Sallow (catkins).

PLUMBEOLATA Hw. Not common. Pascual and ericetal.
DISTRIBUTION—EAST. Tweed o Tay Dee o o o
WEST. ♀ Clyde o o o
LAT. 55°30′-57°-20′. RANGE IN EUROPE. Central. TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. July, August. FOOD-PLANT. *Melampyrum pratense* and ——?

SATYRATA Hb. Common. Nemoral and ericetal. Ascends to 3000 feet.
DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray Sutherland. ♀ ♀
WEST. Solway Clyde ♀ ♀ ♀
LAT. 54°40′-58°30′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June. LARVA. August, September. FOOD-PLANT. Many plants (the flowers).

E. callunaria Dbld. has now been proved by Mr Crewe to be only an aberation of *satyrata*. It is the common form on our heather-clad hills, and has certainly no connection with *Eupatorium*.

HELVETICARIA B. Local. Amongst juniper. Ascends to 1500 feet.
DISTRIBUTION—EAST. o Forth Tay Dee Moray o o o
WEST. o o o o o
LAT. 55°40′-57°30′. RANGE IN EUROPE. Britain, Germany,

France, Switzerland, Finland, &c. TYPE. Occidento-septentrional. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. September. FOOD-PLANT. Juniper.

CASTIGATA Hb. Not uncommon. Nemoral.

DISTRIBUTION – EAST. ♀ Forth Tay Dee Moray o o o
WEST. Solway ♀ o o o

LAT. 54°40′-57°40′. RANGE IN EUROPE. Central, &c. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. August, September. FOOD-PLANT. Many plants.

VULGATA Hw. Common. Agrestal and nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde ♀ ♀ o

LAT. 54°40′-57°40′. RANGE IN EUROPE. Central, &c. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. July. FOOD-PLANT. Low plants; hawthorn.

ASSIMILATA Gn. Not uncommon. Hortensal. Ascends to near 1000 feet.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray o o o
WEST. Solway Clyde ♀ o o

LAT. 54°40′-57°40′. RANGE IN EUROPE. Britain, Holland, France. TYPE. Occidental? TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. August, September. FOOD-PLANT. Currant (*Ribes*) and hop (*Humulus*).

MINUTATA Gn. Not uncommon. Ericetal. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray ♀
Orkney ♀
WEST. Solway Clyde ♀ ♀ ♀

LAT. 54°40′-59°10′. RANGE IN EUROPE. Britain, Holland, Germany. TYPE. Occidental. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June. LARVA. August, September. FOOD-PLANT. Heather, &c.

ABSINTHIATA Cl. Common. Pascual, &c.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray ♀ ♀ ♀
WEST. Solway Clyde ♀ ♀ ♀

LAT. 54°40′-57°40′. RANGE IN EUROPE. Central and north-

ern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August-November. FOOD-PLANT. Ragwort, &c. (flowers).

CONSTRICTARIA Gn. Rare. Pascual. Ascends to about 1000 feet.

DISTRIBUTION—EAST. o Forth Tay o o o o o
WEST. o Clyde o West-Ross o

LAT. 55°40′-57°30′. RANGE IN EUROPE. Britain. TYPE. British. TYPE IN BRITAIN. English?

TIME OF APPEARANCE—IMAGO. July. LARVA. ——? FOOD-PLANT. Thyme (*Thymus serpyllum*).

INDIGATA Hb. Not uncommon. Pinetal. Ascends to 1300 feet.

DISTRIBUTION—EAST. ○ Forth Tay Dee ○ o o o
WEST. o o o o o

LAT. 56°-57°20′. RANGE IN EUROPE. Britain, Germany, Holland, Belgium, Finland, &c. TYPE. Occidento-septentrional. TYPE IN BRITAIN. British?

TIME OF APPEARANCE—IMAGO. May, June. LARVA. July. FOOD-PLANT. Scots fir (*Pinus sylvestris*).

LARICIATA Frr. Not uncommon. Pinetal. Ascends to 1800 feet.

DISTRIBUTION—EAST. Tweed ○ Tay Dee ○ o o o
WEST. ○ Clyde ○ o o

LAT. 55°30′-57°20′. RANGE IN EUROPE. Britain, Germany, Holland, Switzerland, &c. TYPE. Central? TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. July. FOOD-PLANT. Larch and spruce.

ABBREVIATA Stph. Not uncommon. Nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay ○ o o o o
WEST. Solway ○ o o o

LAT. 54°40′-56°30′. RANGE IN EUROPE. Britain, France, Holland, Germany, Catalonia, Italy. TYPE. Occidento-meridional. TYPE IN BRITAIN. English?

TIME OF APPEARANCE—IMAGO. April, May. LARVA. July. FOOD-PLANT. Oak, &c.

DODONEATA Gn. Rare. Nemoral.

DISTRIBUTION—EAST. o o Tay o o o o
WEST. o o o o o

LAT. 56°30′. RANGE IN EUROPE. Britain, Holland, France, Catalonia, Corsica. TYPE. Occidento-central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. May, June. LARVA. July. FOOD-PLANT. Oak.

A moth taken by Sir T. Moncreiffe is referred by Mr Harpur Crewe to this species, with some doubt.

EXIGUATA Hb. Not uncommon. Hortensal and nemoral.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ ♀ o o o
WEST. Solway Clyde o o o

LAT. 54°40′-56°30′. RANGE IN EUROPE. Central. TYPE. Central. TYPE IN BRITAIN. English?

TIME of APPEARANCE—IMAGO. May, June. LARVA. September, October. FOOD-PLANT. Various shrubs and trees.

E. lanceata Hb., whose larva is suspected to feed on coniferæ, may occur.

THE COLEOPTERA OF SCOTLAND.

(*Continued from p.* 228.)

EDITED BY D. SHARP, M.B.

LAMPYRIS Kies.

NOCTILUCA L. Local.

DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. Solway Clyde o o o

TELEPHORUS Oliv.

(*CANTHARIS* Kies.)

ALPINUS Payk. Local.

DISTRIBUTION—EAST. Tweed ♀ Tay Dee Moray o o o
WEST. Solway Clyde Argyle o o

ABDOMINALIS Fab. Rare.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray o o o
WEST. Solway ♀ o o o

RUSTICUS Fall. Common.

DISTRIBUTION—EAST. ♀ Forth ♀ Dee Moray ♀ o o
WEST. Solway ♀ ♀ o o

LIVIDUS L. Not rare.

DISTRIBUTION—EAST. ♀ Forth ♀ Dee Moray o o o
WEST. Solway ♀ ♀ o o

PELLUCIDUS F. Not rare.

DISTRIBUTION—EAST. ♀ ♀ ♀ Dee Moray o o o
WEST. Solway Clyde ♀ o o

LITURATUS Fall. Scarce.

DISTRIBUTION—EAST. Tweed Forth Tay o o o o o
WEST. ♀ ♀ o o o

DARWINIANUS Sharp. Local. Maritime.

DISTRIBUTION—EAST. o Forth o o o o o o
WEST. Solway o o o o

FIGURATUS Mann. Local.

DISTRIBUTION—EAST. ♀ ♀ Tay Dee Moray o o o
WEST. Solway Clyde o o o

T. scoticus Sharp, is a variety of this species, with dark thorax, found in Rannoch, &c.

NIGRICANS Mull. Common.

DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o
WEST. Solway ♀ ♀ o o

The common form in Scotland is *T. discoideus* St.

OBSCURUS L. Local.

DISTRIBUTION—EAST. o Forth Tay Dee Moray o o o
WEST. Solway ♀ o o o

BICOLOR Fab. Common.

DISTRIBUTION—EAST. ♀ Forth Tay ♀ Moray o o o
WEST. Solway ♀ ♀ o o

HÆMORRHOIDALIS Fab. Not common (?)

DISTRIBUTION—EAST. ♀ ♀ ♀ ♀ ♀ o o o
WEST. Solway ♀ o o o

PALUDOSUS Fall. Local.

DISTRIBUTION—EAST. Tweed ♀ Tay Dee Moray ♀ o o
WEST. Solway Clyde ♀ o o

THORACICUS Gyll. Very local.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

Found in numbers near Dumfries by Mr Lennon.

FLAVILABRIS Fall. Local.

DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray ♀ o o
WEST. Solway ♀ o o o

UNICOLOR Curtis. Very rare. In woods.

DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

FULVUS Scop. Abundant.
DISTRIBUTION—EAST. ♀♀ ♀♀ ♀♀ ♀♀ ♀♀ ♀♀ o o
WEST. Solway ♀♀ ♀♀ o o

TESTACEUS L. Local.
DISTRIBUTION—EAST. ♀♀ ♀♀ Tay Dee Moray o o o
WEST. Solway ♀♀ ♀♀ o o

LIMBATUS Th. Common.
DISTRIBUTION—EAST. ♀♀ Forth Tay ♀♀ Moray o o o
WEST. Solway ♀♀ ♀♀ o o

PALLIDUS Fab. Common.
DISTRIBUTION—EAST. ♀♀ Forth Tay Dee Moray o o o
WEST. Solway ♀♀ ♀♀ o o

ELONGATUS Fall. Local. On Scots fir.
DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. o o o o o

MALTHINUS Kies.

FLAVEOLUS Payk. Not rare.
DISTRIBUTION—EAST. Tweed Forth ♀♀ ♀♀ Moray o o o
WEST. Solway Clyde o o o

MALTHODES Kies.

MARGINATUS Lat. Common.
DISTRIBUTION—EAST. ♀♀ Forth Tay Dee Moray ♀♀ o o
WEST. Solway ♀♀ ♀♀ o o

MYSTICUS Kies. Rare.
DISTRIBUTION—EAST. o o Tay o Moray o o o
WEST. Solway o o o o

FIBULATUS Kies. Rare.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

PELLUCIDUS Kies. Common.
DISTRIBUTION—EAST. ♀♀ ♀♀ Tay Dee Moray o o o
WEST. Solway ♀♀ ♀♀ o o

DISPAR Germ. Local.
DISTRIBUTION—EAST. ♀♀ o o o o o o o
WEST. Solway o o o o

FLAVOGUTTATUS Kies.
DISTRIBUTION—EAST. ♀♀ ♀♀ Tay ♀♀ Moray o o o
WEST. Solway ♀♀ o o o

SANGUINOLENTUS Fall. Common.
DISTRIBUTION—EAST. Tweed Forth Tay Dee ♀♀ o o o
WEST. Solway ♀♀ ♀♀ o o

GUTTIFER Kies. Rare.
DISTRIBUTION—EAST. o o ♀ ♀ Moray o o o
WEST. Solway Clyde o o o
MISELLUS Kies. Rare.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o
ATOMUS Th. Local.
DISTRIBUTION—EAST. Tweed ♀ ♀ Dee ♀ o o o
WEST. Solway ♀ o o o

MALACHIUS Kies.

BIPUSTULATUS L. Very rare.
DISTRIBUTION—EAST. ♀ Forth Tay o o o o o o
WEST. ♀ o o o o
MARGINELLUS Ol. Very rare.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

DASYTES Kies.

PLUMBEO-NIGER Goez. Very rare.
DISTRIBUTION—EAST. o [Forth] o o o o o o o
WEST. Solway o o o o

HAPLOCNEMUS Kies.

IMPRESSUS Marsh. Very rare.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

PHLÆOPHILUS Kies.

EDWARDSI Steph. Rare.
DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway ♀ o o o

CLERIDÆ.

CLERUS Kies.

FORMICARIUS L. Highland. On logs of Scots fir.
DISTRIBUTION—EAST. o Forth Tay Dee Moray o o o
WEST. o ♀ o o o

CORYNETES Kies.

RUFICOLLIS Fab. Rare. In carcases.
DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway ♀ o o o

(To be continued.)

ZOOLOGY.

THE BIRDS OF THE SOUTH-EAST OF SCOTLAND.

By D'ARCY W. THOMPSON.

THERE is perhaps no part of the kingdom whose bird-population is of greater extent or interest than that of the south-eastern district of Scotland. The counties of Berwick and Roxburgh, Fife and the Lothians, besides affording sufficient area and sufficient variety of conditions to accommodate a very large proportion of our native birds, are at the same time most favourably situated to receive irregular and straggling visitants. St Abb's Head, the Bass Rock, the Isle of May, along with many of the smaller rocks and islets in the Firth, are the haunts and breeding-places of innumerable sea-fowl: the estuary of the Tyne, and several other similar spots, afford congenial localities for Herons, Sandpipers, and many more "lang-leggit" birds; while the Cheviots, the Lammermoors, and the Pentlands, the woods and cultivated districts of the Lothians and Fife, are all abundantly frequented by their natural occupants; and, in addition, every stormy winter brings us many rare and interesting strangers from the opposite shores of the North Sea. Moreover, the number of naturalists and collectors, though they work sad havoc among many of our once common birds, serve to keep us fully acquainted with every unlucky rarity that may occasionally visit us.

Among the rarest and most important captures that have been made in our district may be mentioned the following: Tengmalm's Owl, Golden Oriole, Bohemian Waxwing, Pennsylvanian Pipit, White-winged Crossbill, Pallas's Sand-grouse, American Bittern, Stork, Spoonbill, Brown Snipe, Blue-winged Teal, Little Gull, Fork-tailed Petrel, &c.; while among our more frequent or regular visitants are the Mealy Redpoll, Crossbill, Quail, Dotterel, Little Stint, Eider-Duck, Little Auk, Lesser Tern, Solan-Goose, and so on.

As in all other parts of the country, the cruel policy of battue-

loving sportsmen has terribly diminished our hawks and owls, and indeed the larger species of both now only gain admission to our lists as occasional stragglers. In the same manner the disgraceful slaughter of sea-birds proceeds in the summer months, all the more hotly that its period is somewhat limited by an ineffective Act. The number of Solan-Geese, for instance, that are thus destroyed is almost incredible,—two or three hundred birds in a day being often killed at the Bass by a single excursion-party.

I have not restricted myself, in the following catalogue, to any very sharply-defined limits; but I have frequently inserted notices of specially interesting birds from localities slightly without our proper district. In compiling the list, I have availed myself of Mr Gray's classic 'Birds of the West of Scotland,' which contains much interesting information anent those of the East Coast also; Dr Turnbull's useful little book on the 'Birds of East Lothian;' the careful record which Messrs Embleton, Tate, and Kelly, and other members of the Berwickshire Naturalists' Club, have kept of rare captures in that county; and the similar notes which Dr J. Smith and others have long communicated to the Royal Physical Society. The other sources from which I have occasionally drawn information will be mentioned with the entries to which they refer; but I take this opportunity of recording my thanks to Mr Scot Skirving, Mr Ivison Macadam, and last, but not least, to Mr Small, the well-known Edinburgh bird-stuffer, for much valuable information.

RAPTORES.

FALCONIDÆ.

1. AQUILA CHRYSAETOS. *Pall.* The Golden Eagle.
   A rare visitant; chiefly young birds in autumn and winter. North Berwick, 1865;[1] Coldingham, March 1866;[1] Innerleithen, Feb. 1876; Roxburgh, 1876, and Jan. 1877 (Berw. Nat. Proc., vol. viii. p. 196); Dunse, Jan. 1877.[2] Examples have also been seen at East Linton, Hutton Mill, Lauder, &c.

2. HALIAËTOS ALBICILLA. *Leach.* The Erne, *or* White-tailed Eagle.
   A rare straggler, but probably more frequent than the

[1] Turnbull's 'Birds of East Lothian.' [2] Proc. of Berw. Nat. Club.

former species. Tynninghame, Dec. 1858;[1] Kinkell, Fife, Dec. 1866; Cheviots, March 1874; Lammermoors, October 1874 (Berw. Nat. Proc., vol. vii. p. 293-301); Marchmont, Jan. 1877.[1] Also at Greenlaw, St Abb's Head, &c.

3. Pandion Haliaëtos. *Cuv.* The Osprey.
Another irregular visitant. Dunbar, 1852;[2] Lauderdale, 1857;[1] Berwick, 1867;[1] Falkirk, Oct. 1868;[2] Burnmouth, Sept. 1871;[1] Floors, near Kelso, 1873.[1] Several old or unauthenticated instances are mentioned in the Proc. of the Berw. Nat. Club, and elsewhere.

[Falco Gyrfalco. *Linn.* The Gerfalcon.
Said to have been found in Forfarshire in 1812. G. Don. *Vide* Gray. Aberdeenshire, Pennant, ed. 1772; Argyleshire, Sept. 1866 and 1868.[2]]

4. Falco peregrinus. *Gmel.* The Peregrine.
Not yet extremely rare, but greatly diminished. A pair still breeds regularly on the Bass Rock; also, until recently, at St Abb's Head, and still, perhaps, at Fast Castle. Said also to breed in Lauderdale,[1] on the Cheviots, Isle of May, &c.

5. Falco subbuteo. *Linn.* The Hobby.
Rare. Portobello, July 1863; Dumfries, June 1867; Bowmont Forest, 1870;[1] Innerleithen, 1872; Dunse, 1872;[1] Berwickshire (two specimens), 1874.[1]

[Falco rufipes. *Temm.* The Red-footed Falcon.
A very rare bird. Foveran, Aberdeenshire, 1866;[2] Hauxley, near Alnwick, 1868.[1]]

6. Falco æsalon. *Gmel.* The Merlin.
Rather numerous. Common near Edinburgh in the winter-time. Breeds in Peeblesshire and Berwickshire.

7. Falco tinnunculus. *Linn.* The Kestrel.
The commonest of our hawks, but very greatly reduced in numbers.

[1] Proc. of Berw. Nat. Club. [2] Gray's 'Birds of the West of Scotland.'

8. Astur palumbarius. *Bech.* The Goshawk.
Very rare, but probably more frequent in our district than in the West of Scotland. Tynehead, Dec. 1865; Jedburgh, Nov. 1869;[1] (Aberdeen, 1875 and 1876;[2]) Dalkeith;[3] Elie, Jan. 1877;[4] Berwickshire, Jan. 1876.[4]

[Astur atricapillus. *Wils.* The American Goshawk.
A specimen was shot on Schiehallion in the spring of 1869. *Vide* Gray, p. 39.]

9. Accipiter nisus. *Pall.* The Sparrow-hawk.
Tolerably common, but less so than the Kestrel.

10. Milvus regalis. *Kaup.* The Kite.
All but extinct throughout Scotland, and stragglers are of rare occurrence. Gladsmuir Woods (Turnbull); two at Blair Athole, Feb. 1876.[2] Mr Gray, writing in 1871, thought that the Kite still bred in Perth and Aberdeen.

[Milvus niger. *Bp.* The Black Kite.
Forfarshire, G. Don. Near Alnwick, May 1866.]

11. Buteo vulgaris. *Bech.* The Common Buzzard.
No longer breeds in our district, but specimens are killed every year, principally in autumn and winter.

12. Buteo lagopus. *Leach.* The Rough-legged Buzzard.
In some seasons this species is exceedingly abundant along the coast, &c., owing probably to migrations from the Scandinavian forests. Especially numerous in 1840-42,[1] 1863, 1875-76, and other years.

13. Pernis apivorus. *Cuv.* The Honey Buzzard.
Another rather frequent visitant. Three in Berwickshire, June 1845;[3] Tynninghame, May 1856;[5] Dunbar, 1862;[1] Ratho, 1862;[5] Kelso, May 1865;[4] two in Berwickshire, 1876;[4] several at Yester, 1877,[2] &c.

14. Circus æruginosus. *Sav.* The Marsh Harrier.
Extremely rare. Falkirk, July 1855;[1] Seacliff, Oct.

[1] Gray's 'Birds of the West of Scotland.' [2] 'Scottish Naturalist.'
[3] Turnbull's 'Birds of East Lothian.' [4] Proc. of Berw. Nat. Club.
[5] Trans. of Roy. Phys. Soc.

1874;[1] Tweedside, Oct. 1875.[2] Occasionally seen in East Lothian: Gray.

15. CIRCUS CYANEUS. *Boie.* The Hen Harrier.
This species, though formerly very much more common than the last, is now also exceedingly rare. Bred until a very few years ago in Berwickshire, and was once very abundant on the Lammermoors.

[CIRCUS MONTAGUI. *Yarr.* Montagu's Harrier.
Selby mentions the occurrence of a specimen in Berwickshire. One was shot near Alnwick, May 1847.[2]]

STRIGIDÆ.

16. BUBO MAXIMUS. *Sibb.* The Eagle Owl.
Of very doubtful occurrence within the precise limits of our district. Fifeshire (Pennant, ed. 1772); Aberdeen, Oct. 1866;[3] Pitlochry, Jan. 1873.[4]

17. OTUS VULGARIS. *Flem.* The Long-eared Owl.
This species, though rare, according to Mr Gray, in the West of Scotland, is probably the most abundant of our Owls. Like the rest of them, however, it is everywhere destroyed by the gamekeepers.

18. OTUS BRACHYOTUS. *Boie.* The Short-eared Owl.
This bird, like the Rough-legged Buzzard, and one or two others, is very abundant in some seasons, while in general very scarce. Dr Turnbull mentions a nest at Blinkbonny, East Lothian. Mr Gray says it often breeds in that county, but I have heard of no recent authenticated instance. Specimens were particularly abundant in the winter of 1875-76, and rather less so in 1876-77.

19. STRIX FLAMMEA. *Linn.* The Barn Owl.
Tolerably abundant, but not so much so as either the Long-eared or Tawny Owl.

20. SYRNIUM STRIDULUM. *Brehm.* The Tawny Owl.
Nearly, if not quite, as common as the Long-eared Owl.

[1] Trans. of Roy. Phys. Society.
[2] Proc. of Berw. Nat. Club.
[3] Gray's 'Birds of the W. of Scotland.'
[4] 'Scottish Naturalist.'

[SURNIA NYCTEA. *Selby.* The Snowy Owl.
Near Montrose, Dec. 1867. Gray in Proc. Nat. Hist. Soc. of Glasgow.]

21. NOCTUA TENGMALMI. *Cuv.* Tengmalm's Owl.
A very rare bird indeed. Cramond Island, Dec. 1860 (Dr Smith in Trans. Roy. Phys. Soc., ii. p. 244); Berwick, Feb. 1873 (Trans. Berw. Nat. Club, 1873, p. 132).

INSESSORES. DENTIROSTRES.

LANIADÆ.

22. LANIUS EXCUBITOR. *Linn.* The Great Grey Shrike.
Not uncommon as a winter visitant. Specimens have been seen in all the south-eastern counties, more especially in East Lothian and Berwickshire. One specimen was noticed within the town of Edinburgh in 1866.[1]

23. LANIUS COLLURIO. *Linn.* The Red-backed Shrike.
Very much rarer in our district than the last-named species. Two at Dunbar, 1856;[2] two at Dunse, July 1859; Cupar, 1861;[2] Gordon, Berwickshire, 1865.[3]

[LANIUS RUFUS. *Temm.* The Woodchat Shrike.
Forfarshire. G. Don.]

MUSCICAPIDÆ.

24. MUSCICAPA GRISOLA. *Linn.* The Spotted Fly-catcher.
Common throughout the district.

25. MUSCICAPA ATRICAPILLA. *Linn.* The Pied Fly-catcher.
Rare. Dunse, June, 1855 and 1856;[1] Dunbar, May 1867;[2] Berwickshire, May 1872;[4] North Berwick, 1876. Mr Harvie Brown has also met with this species in Stirlingshire.

[1] Trans. of Roy. Phys. Society. [2] Gray's 'Birds of the W. of Scotland.'
[3] Turnbull's 'Birds of East Lothian.' [4] Proc. of Berw. Nat. Club.

(*To be continued.*)

BIOLOGICAL LIBRARY MASS.

ON MIGRATION.

By Colonel DRUMMOND HAY, C.M.Z.S.

(*Continued from page* 241.)

MIGRATION in this country I will, for convenience sake, treat under four heads—namely, *true* or *regular; local* or *partial; accessory;* and lastly, *occasional* or *accidental*, or, as it has been termed, *pseudo-migration*. The term "true migrant," in the strict acceptation of the word, according to Mr Gould, cannot be applied to a bird in the country in which it was bred, for that is its true habitat; but in the country to which it resorts for food or climate, it is there a true migrant. Thus our Swallows and other summer birds, according to this, are not truly migrants in this country, and the only ones that can claim to be such are the Fieldfare, Redwing, and others, which are impelled to visit us in winter solely to obtain food for their existence. I shall, however, adopt the broader view of the word, and take these two sections of summer and winter visitants under the one head of regular migrants. About fifty species of the former visit these islands from the south every spring, while a still larger number, if we include all our water-birds, visit our milder and more equable climate each winter, instinctively knowing that they will here find that food and shelter which the more rigorous weather of the northern regions deny them. A large proportion of our summer visitants confine themselves to the southern and midland counties, through which they are pretty generally diffused, but do not go much farther north than in a line with York, with the exception of a few which may occasionally straggle into Scotland, though reaching a far higher latitude on the Continent of Europe, as I have previously shown. Others, again, from what cause it is difficult to say, are very partial and even capricious in their visits: thus the Nightingale restricts itself almost entirely to the southern, eastern, and central counties, never favouring Cornwall with its presence, and rarely even Devonshire or Wales, while northwards it seldom goes beyond Yorkshire or Durham.

Ray's Yellow Wagtail (*Budytes Rayi*) may also be cited as exceedingly partial in its visits. "We who reside in England should be extremely proud of the beautiful Yellow-field Wagtail, for ours is the only country in which it passes the summer. Why

this should be it is not easy to say, but such is the case; near as is the Continent, it is rarely found in any part of it" (Gould's 'Brit. Birds,' vol. iii. p. 5). And Mr Cordeaux says that this summer visitant in the Humber district is the most common and least aquatic of any of the Wagtails; and Mr Gray that the Oat-ears, or Seed-ladies, as they are called in Lanarkshire, are very common on their arrival in the month of April, dispersing themselves over a tolerably wide tract in the west of Scotland; and also that the Yellow Wagtail is to be found in like numbers as far as Forfarshire. This being the case, it is curious that, though I am intimately acquainted with this bird, I have never observed it in Perthshire, or any of the neighbouring counties, where the Grey Wagtail is abundant, and which, in its winter plumage, might be mistaken for the other, both birds being of a brilliant yellow. The Pied Fly-catcher, again, does not rest, says Mr Gould, until it has reached the middle and northern counties of England, where, according to Mr Heysham, in the 'Mag. of Nat. History,' it is very plentiful in some parts of Westmoreland. It occasionally visits Scotland, though sparingly; and Mr Gray records the fact of its having bred in Inverness-shire; but this bird I have never met in Perthshire, or any of our eastern coasts. Other portions of summer visitants of *regular* migration spread themselves throughout the whole length and breadth of the land, but become more sparse as they approach the extreme north. In the county of Perth we are favoured with about twenty species of these, and in our own immediate neighbourhood round Perth are to be found the following, which I give in rotation, much as I have observed them arrive:—

1. Willow-Wren.
2. Wheatear.
3. Sand-Martin.
4. Swallow.
5. Blackcap.
6. White-throat.
7. House-Martin.
8. Sedge-warbler.
9. Wood-Wren.
10. Whinchat.
11. Red-start.
12. Garden-warbler.
13. Tree-pipit.
14. Cuckoo.
15. Landrail.
16. Swift.
17. Spotted Fly-catcher.

Though I am now speaking only of land-birds, to these might be added the Common Sandpiper, arriving early in May, its cheery piping note on the banks of all our lochs and streams being so well known to all. The Ring-ouzel, or Hill Blackbird, is a *regular* and early summer visitant, but confines itself to more hilly parts of the county than the immediate vicinity of

Perth. The Grasshopper-warbler has also been noticed in this neighbourhood, but until more information is gained it cannot be classed as a *regular* summer visitant. Among the first of our summer birds to arrive towards the end of March is the Willow-Wren, which, along with the White-throat and the Little Sedge-warbler, is the most abundant in this neighbourhood. The Wheatear, equally early with the first, and as abundant in many parts of the country, confines itself more to the rabbit-warrens on the coasts, and the higher hills in the interior. Though the Wheatear may work its way along the shores of England from the south till it reaches our more northern regions, still I am inclined to believe that its true vernal line of passage to Scotland is direct across the German Ocean from Holland or Belgium, a little over 300 miles. In confirmation of this, Mr Gray, in his 'Birds of the West of Scotland,' p. 88, says: "On the Dunbar Links, in the month of March, I have seen them arriving in thousands, and flying before me, in my early morning walks, like bits of sea-foam borne by the breeze;" and further says, "I have never seen such arrivals on any of the sea-borders of the west of Scotland." In April comes the Swallow, and others follow in rapid succession. Towards the first of May we hear the Cuckoo and the Landrail, while a little later the Swift makes its appearance, and last of all the Spotted Fly-catcher, generally about the 12th or 15th of the month. Last year the first noticed was on the 17th. The less widely spread are the Garden Warbler and the Tree-pipit.

Though hundreds of Swallows, House and Bank Martins, chiefly young birds, appear in the autumn, their numbers seem greatly to have diminished both on their arrival and during the breeding season in this part of the country. Few are now to be seen in the summer months in comparison with former years, when I can recollect many an open shed, cottage window, and eave of house, each with its colony of Swallows and House-Martins, and closely-packed nests, where there is not one now. The same may be said of the Sand-Martin: many a bank and gravel-pit, which formerly held its scores, now lie tenantless. This, I am told, has been noticed also in other parts of the country. I may mention, that though I have ceased to notice the House-Martin as plentiful as heretofore in their old quarters, I have lately observed them, while ascending Glen Tilt, breeding in large numbers on the lonely cliffs of Ben-y-Gloe, much as I have seen the Rock Martin (*Cotyle rupestris*) do in southern Europe. The Swift, on the other hand, seems to be considerably increased in numbers.

Among our *regular* winter visitants to the county, we have the Red Wing, Fieldfare, Bramble Finch, Snow-Bunting, Jack Snipe, Water-rail, Wild Geese, and several other species of water-fowl. The two first arrive earlier or later in September and October, according to the state of the weather. The Jack Snipe is generally regular, coming almost to a day, about the 5th of October. Last year it was somewhat earlier, and so was the Water-rail, the former on the 29th of September, when there was a considerable arrival both of it and the Common Snipe, which, however, must be considered among the *accessory* migrants. The first Water-rail noticed last year was on the 1st of October; it is, however, the middle or the end of the month before they generally arrive. The Wild Geese are also very regular, both as to their arrival and departure, coming the first week of October, and leaving us the third week of April.

The less widely spread of those mentioned in the above list of summer birds are the Garden-warbler and Tree-pipit. This list, however, must not be taken as the total of our summer visitants round Perth, for we have the Stone-chat, Meadow-pipit, Pied and Grey Wagtails; but these are all *partial* or *local* migrants, remaining all the year in this country, merely shifting their quarters to other parts, either to the southern counties or to our sea-shores, returning again regularly in spring. Both our Wagtails, however, occasionally stay with us the whole winter, and at other times disappear. This winter I have constantly seen both species up to this present date (7th February). Under this head of *partial* or *local* migration the Song Thrush must be classed, which, though essentially migratory on the Continent, is with us only partially so, betaking itself in autumn to the open fields, especially turnips, when they are joined by many foreigners, which arrive in great numbers from Norway and Sweden, all leaving us in the beginning of October, our native birds returning to us again about the first or second week of February. This very fact is remarked upon by Professor Newton, as observed by him in Norfolk ('Ibis,' 1860, p. 84). In Torquay, South Devon, I found the Thrush abundant during the whole of the winter months, and at that season even in full song. Our more *local* migrants consist chiefly of the Waders, such as the Oyster-catcher, Curlew, Redshank, and Ringed Dottrel,—all these arriving regularly in the spring on their way to the hills and uplands for breeding purposes. The Oyster-catcher is very regular in its arrival, about the beginning of March, soon after which, in all

the haughs and lower-lying fields in Athole and other Highland districts, the well-known form of the Sea Piot, with its shrill piping note, may be seen, like the Rook, following the plough, and grubbing for worms.

Accessory migration consists of such as reinforce our sedentary birds, and even some of those that are of *partial* migration, arriving every autumn in large numbers from the Continent. Thus we have fresh levies every year of Linnets, Redpoles, Siskins, Goldcrests, Robins, Larks, Blackbirds, and Thrushes, Hawks, Owls, Woodcocks, Snipe, and a host of others, besides wildfowl innumerable. Some of these *accessory* migrants appear in such wonderful masses as to create profound astonishment; and Mr Gray mentions an instance in that of the Lark, which appeared some years ago in such prodigious numbers near Girvan, that on rising into the air they formed a dark cloud of the most singular appearance; and, on one occasion, in the confusion of their movements, the whole body crossed one of the public roads, by the side of which there were several lines of telegraph wires, but the mass of birds was so compact that none of those in a line with the wires escaped destruction. As soon as the flock was past dozens were picked up dead or mutilated, portions of wings torn from the living bird being even found adhering to the wires. Mr Cordeaux also bears witness to extraordinary flights of Larks arriving on the coast in the Humber district; and the late Dr Saxby relates that flocks return in large numbers of several hundreds through Shetland, on their way north, in the month of March. The little Gold Crest also reaches our shores in large flocks every year, about the middle of October. Both at the Spurn and Flamborough Head they are frequently found dead beneath the lighthouses, having dashed bewildered against the glass lanterns on their migration; and Mr Cordeaux, who has paid much attention to our migratory birds, is of opinion that these autumn flights again leave our shores in the spring, but that the journey is then performed in little companies, and that they thus escape observation. In this neighbourhood,[1] in the large fir and spruce woods about Scone, I have, in the late autumn and early winter, frequently observed immense quantities of Goldcrests, I may say in hundreds, flitting from tree to tree, evidently part of some of these great autumnal flights. The Woodcock, too, which is generally preceded by this little bird, from which on some parts of the coast it bears

[1] Perth.

the name of the Woodcock Pilot, is now well known to be resident in this country, rearing two, if not three, broods a-year. Though long supposed to be a winter migrant only, it receives large accessions every year from the north, perhaps replacing those that may have moved farther south or west as the case may be, though not actually leaving Great Britain, but only performing a *partial* or *local* migration,—many possibly being even sedentary in some parts of the country, and never quitting their native woods; but whether these seeming residents are really so or not it would be difficult to prove without some distinguishing mark. Sir Thomas Moncreiffe, a keen observer in all matters of natural history, assures me that the woods on Moncreiffe Hill are never, at any time of the year, without Woodcock; that numbers are bred there annually; and that it is his firm belief they never leave them.

I have never heard it explained how the western parts of the country are so proverbially the home of the Woodcock, while in the eastern parts they are comparatively few. I can quite understand the attraction to the west, as a milder and more genial climate; but from whence come these large flights of western Woodcocks? Do they reach the eastern coast first, and then cross overland from thence? or do they strike the northern parts of Scotland, and then spread down the western shore, and so reach the north of Ireland? I think not; as I have never been able to trace them in any great numbers in this direction. The direct line of migration seems to me to be naturally the eastern coast; and Mr Cordeaux confirms this when he says that, with the prevailing winds off the land from south to west, it is never a great Woodcock season on the east coast; but strong winds blowing anywhere from the opposite quarters—south-east to north-west—and especially if accompanied with thick foggy or drizzly weather—and the stronger the wind and wilder the weather, the greater number of birds, as a rule, may be found—and that the probability is that, with the prevailing winds from south to west, which are then never good Woodcock seasons on the east coast, that they do not alight, but pass over in the night, and are first heard of in the west of England or Ireland (of course the same stands good for the west of Scotland); and this I quite agree in believing to be the true line of flight—returning to the east coast, according to Mr Cordeaux, about the first week in March.

But, perhaps, of all our *accessory* migrants, none concerns us

or the interests of the farmer more than that of the Wood-Pigeon, as there can be no doubt but what these birds reach us from the Continent in large hordes every year; otherwise, looking to the great increase in the eastern counties of Scotland, and the destruction of so many thousands annually taking place there, no such increase, says Mr Gray, can reasonably be traced to the results of a single breeding season; and in accordance with this opinion, he instances a wonderful invasion, which he himself witnessed, about three miles east of Dunbar. "I had gone out," he says, "about daybreak, and was astonished to see a prodigious cloud of pigeons, fully a mile seawards, steering for the nearest land. The entire body of birds alighted on the sandy beach at Catcrag Bay, which they completely covered. I am satisfied there must have been in the flock twenty or thirty thousand pigeons, at the lowest computation; and from the fact of their alighting immediately on reaching land, without any preliminary survey of the ground, I concluded they had come in from a long journey."

The subject under this head (*Accessory migration*) is too extensive to be dealt with here fully. I will, therefore, take up the next head of *occasional*, *accidental*, or *pseudo migrants* to Great Britain. The list is large, not only comprising many from the European continent and the more eastern parts of the Old World, but also a large number of pseudo-migrants from the continent of America; and it may be here interesting to record a few from the former, which have been either noticed or obtained round Perth within a radius of ten miles.

Great Shrike.—Several instances have occurred, especially of late years.

Rose-coloured Pastor.—Two or three in former years in the Carse district, at Megginch.

Hoopoe.—The same may be said of the Hoopoe; and one is now in the possession of Sir Thomas Moncreiffe, shot by him at Craigie.

Waxwing.—No record of this bird, though I believe it to have been captured in this vicinity; and a year or two ago a specimen was obtained in the neighbouring shire of Fife.

Roller.—This bird was seen by me, many years ago, at Megginch, remaining for some time in the neighbourhood, and was called by the people the German Parrot.

Hawfinch.—Two of these birds were shot near Murray's Asylum,

Perth, in the winter of 1860-61, and came into the possession of Dr M'Intosh, who has kindly presented one of them to the Perthshire Society of Natural Science.

Crossbill.—These I have not noticed of late; but as previously mentioned, they appeared in enormous numbers in all this district in 1838.

American White-Winged Crossbill.—About six or seven years ago, what I took to be these birds were seen by me in the Kinfauns woods, in a small party of six or seven; but I was unable to obtain a specimen.

Turtle-dove.—These birds I have noticed more than once in the Carse of Gowrie; and the summer before last three flew past me near Murie. The bird is too well known to me to have mistaken it.

Spotted Crake.—Frequent examples of this little Crake have been seen by me on the banks of the Tay in autumn, one of which is now in my possession.

Solitary Snipe.—One example of this bird was seen by me on the banks of the Tay on the 3d September 1874—the only one I have ever seen in Scotland.

Purple Waterhen (*Porphyrio smaragdonotus*).—Among other waterbirds, one specimen of this Porphyrio was obtained two years ago on the banks of the Tay. See Scot. Nat., vol. iv. p. 87, 1877.

I may also add the Quail as an *occasional* visitant. Formerly it was of *regular migration* in the Carse of Gowrie, where it bred. The last nest known to me was in the garden-hedge at the Manse of Errol, in the summer of 1832.

But of pseudo-migrants, perhaps the most extraordinary on record is the irruption of Pallas's Sand Grouse into Great Britain, from the plains of Tartary, in the year 1863. The first observed in this country were three that were shot in the year 1859, one in Wales and two in Norfolk; but it was not until the year abovementioned that the Great Tartar invasion, aptly so called by Professor Newton in his most interesting paper on the subject ('Ibis,' 1864, p. 185), took place throughout Europe,—"effecting a journey of some 4000 geographical miles, none of them guided to a fixed goal by the traditional instinct of migration accumulated through long generations, but all urged by some, not less forcible, impulse." Many hundreds reached our own shores, stretching from North Unst in Shetland to the English Channel. In the

long list of localities visited by these birds, and so carefully drawn up by Professor Newton, I do not find any record of their having been noticed in Perthshire, though in the neighbouring county of Forfar several were seen, and six shot on the Links of Montrose. Comment on the sad reception of these birds would be here out of place; I may, however, say that, had they not been everywhere shot down in the shameful way they were, *Syrrhaptis paradoxus* might, by this time, have become perfectly naturalised, and been added to the British avifauna.

In addition to birds reaching us from the continent of Europe, and these more eastern parts of the world, we are, as before stated, also visited by many from the continent of America, from whence no less than *sixty-nine* species have been, from time to time, noticed in Europe, and over fifty of these in the British Islands alone. Professor Baird of the Smithsonian Institute, in his most interesting and instructive paper on the Distribution and Migrations of North American Birds, in the 'American Journal of Science,' 1866 ('Ibis,' 1867, p. 72), says, "In nearly all cases these specimens belong to species abundant during summer in New England and the eastern provinces of British America, and that the clue to these peculiarities, attending the interchange of species of the two Continents, will be found in the study of the laws of the winds of the northern hemisphere as developed by Professor Henry and Professor Coffin." It is curious to note, that nearly all of the fifty species that have appeared in Great Britain have been got in England, only one or two in Scotland; and the same may be said of Ireland. Of Scottish specimens, I will only mention one—the Ruby-crowned Wren—shot on the banks of Loch Lomond by Dr Dewar of Glasgow (Gray, p. 200), in company with a large flock of Gold Crests in the summer of 1852. Another specimen was also got in England, obtained by the Rev. Dr Tristram, it having been got in the flesh, from a Durham pitman, who had killed it in the same year; and from this circumstance, Mr Gray is in favour of the surmise, that a migratory flock of these diminutive birds may have been driven out of their ordinary flight, and have come, probably through prevalent westerly winds, in the direction of Greenland, from the south of which they would travel by stages—namely, Iceland and the Faroë Islands—to our shores. Whether such were the case, or that, caught up by a westerly gale, and furiously driven before it across the

broad Atlantic, the fact remains the same, creating wonder and surprise that a bird so small and so weak, not bigger than our little Golden-crested Wren, should be enabled to effect so marvellous a journey.

I might dwell much longer on this subject, were it not that I fear I have taken up too much space already. In conclusion, therefore, I will only say, that should the remarks which I have made (and which, on my part, I feel may be very defective) in any way create an interest, so as to induce others to pay attention to, and throw further light on, a subject so fraught with wonders as that of migration, I shall feel myself more than repaid.

Dead Wood-Pigeons.—It is a very common thing in our Norfolk woods to hear the remark made that a hawk has been killing a wood-pigeon here, and to find a number of feathers, of the identity of which there can be no doubt, on the ground. Many other observers, in other parts of Great Britain, would say the same thing has often come under their notice in woods and forests. I have sometimes found it impossible, in places where wood-pigeons were abundant, to ramble a mile without coming on the remains of a dead one or two; and I have again and again, on finding such remains, heard the crime assigned to a hawk. In my own mind I have always acquitted the hawks, not believing that this was putting the saddle on the right horse. It has always seemed to me more probable that the explanation of the mortality might be found in disease. To what extent birds are subject to it we do not know. Like the age to which birds in a state of nature live, it is one of those questions about which there is still a great deal to be learned. I would merely throw out the suggestion, and we shall see if it meets with any endorsement from Scottish naturalists, that the wood-pigeon is more subject to disease than other birds, and that their liability to this mortality, over and above the ills that other bird-flesh is heir to, is designed by a provident nature to check the too rapid increase of a bird which is becoming a great nuisance in some parts of England, and which, if I mistake not, has had a price set upon its head by the farmers of Scotland.—J. H. GURNEY, junr., Northrepps Hall, Norwich.

Acherontia atropos.—Two very fine specimens were captured in this neighbourhood lately. One was obtained on the 21st of May, and the other on the 3d of June. From their fresh appearance, they do not seem to have been long out of the pupa state. Is this not early for these specimens to be found in Scotland?—ANDREW BROTHERSTON, Kelso.

Alternation of Generations in the Cynipidæ.—At page 117 I called attention to the reported discovery that dimorphism or alternation of generations occurred in the gall-making *Cynipidæ*. At page 152 Mr P. Cameron endeavoured to show—from negative evidence only—the improbability of such being the case. Direct experiments, made by M. Lichtenstein, Mr Fletcher, and Mr P. Cameron himself, have quite confirmed Dr Adler's statements.

THE LEPIDOPTERA OF MONCREIFFE HILL.

By Sir THOMAS MONCREIFFE, Bart.

(*Continued from page* 244).

Deltoides.

294. Hypena proboscidalis ; *c*

Pyralides.

295. Pyralis farinalis ; *f*
296. Aglossa pinguinalis ; *f*
297. Pyrausta purpuralis ; *r*—I have one specimen of this insect, captured on my window on the morning of August 22, which had probably come into light on the previous night. I have also one specimen of—
298. P. ostrinalis, captured while flying in the sunshine on a rocky face, at an elevation of 550 feet, on June 17, 1872. Surely these are different insects. There is no mint near where the latter was taken. The size, shape, colour, markings, and habitat are totally different.
299. Ennychia cingulata ; *c*
300. Hydrocampa nymphæata ; *c*
301. Botys verticalis ; *r*
302. „ fuscalis ; *f*
303. Pionea forficalis ; *c*
304. Scopula lutealis ; *c*
305. „ prunalis ; *c*
306. Nomophila hybridalis ; *r*
307. Simaëthis fabriciana ; *c*
308. Scoparia cembræ ; *f*
309. „ ambigualis ; *c*
310. „ dubitalis ; *c*
311. „ cratægella ; *c*
312. „ mercurella ; *c*
313. „ murana ; *c*
314. Aphomia sociella ; *c*
315. Achroëa grisella.—An old hive stowed away, full of comb, in a shed, was attacked by this insect in 1872, from which I obtained a copious supply.
316. Nephopteryx abietella.—Probably not uncommon if bred, but rare in the imago state.
317. Pempelia subornatella.—Common, but local.

Crambidæ.

318. Crambus falsellus ; *f*
319. „ pratellus ; *c*
320. „ dumetellus ; *r* ?
321. „ hortuellus ; *c*
322. Crambus culmellus ; *c*
323. „ inquinatellus ; *r*
324. „ pinetellus ; *c*
325. „ perlellus ; *r*

NYCTEOLIDÆ.

326. Hylophila prasinana; *f*

TORTRICINA.

Sarrothripa revayana.—I took about twenty specimens flying at dusk, between January 30 and April 27, 1872. I presume I hit upon a brood; they were all flying near Cupressus. I have not taken many specimens in other seasons. They vary considerably.

Amphysa gerningana.—This is a local species, but is not uncommon in one or two localities from 500 to 600 feet of an elevation. Frequents heather, *Calluna vulgaris*. Flies in the afternoon, at the end of July and in August.

Eulia ministrana.—Distributed generally over the face of Moncreiffe Hill, and not especially near hazel. Indeed I think it is most common at an elevation of 600 feet, where no hazel is to be met with. This is an early insect, floating about in the fine afternoons in May.

Penthina corticana.—Rather an uncommon insect. I have taken it flying in the evening, and at rest on tree-trunks in June.

P. betuletana.—More frequent than the former. To be beaten off birches or resting on the undergrowth beneath them in August.

P. prælongana.—A more common insect than either of the former on the lower grounds of Moncreiffe, and also to be met with up to 600 feet. To be beaten out or taken on the tree-trunks in June.

P. cynosbatella.—This is a very common insect in my garden in June. It appears to prefer plum, pear, and apricot trees to any others. I have reared it from *Pyrus japonica*.

Lozotenia musculana.—Common, and generally distributed. It is one of the early tortrices that cheer one by their appearance in the beginning of May. Here it is decidedly attached to oak, but I was puzzled once by meeting with it flying in numbers about a wall-side on the open moor near Loch Broom, some distance from any plantation.

L. xylosteana.—Frequent some seasons among the oaks in my shrubbery, but by no means common. Is to be found up to 500 feet. Appears in August.

L. rosana.—Abundant in my garden some seasons, from the

8th June till the middle of August. If not looked to in the early stages is very destructive to apricot and pear trees.

Batodes angustiorana.—I have reared this insect from yew, the leaves of which it spins together; I have also found the larva comfortably rolled up in the centre of the stone of the last year's yew-berry. Those I reared appeared in May, but I take the perfect insect also in August.

Ptycholoma lecheana.—Not common. Appears among oak trees here from June till August.

Pardia tripunctana.—Abundant among rose-bushes in the garden, and to be met with in the June evenings about hedge-rows in which the dog-rose grows.

Lithographia cinerana.—I have collected many of this form from poplar, and I have also collected a large number of the form—

L. nisella, from sallow. I have also bred the *cinerana* form from poplar, and I must confess I strongly incline to think they are different insects, as I have never taken or bred from poplar the richly marked insect which is attached to sallow. The basal patch is also almost always strongly defined and filled up with colour to the very base of the wing in *nisella*, whereas in *cinerana* it seldom if ever is so. Here, also, the manner of the insect is quite different. The poplar species, when beat off, almost invariably returns to the trunk of the tree or darts off to some neighbouring trunk. The sallow form flies away, sometimes at some elevation, and requires a sharp net or pursuit to capture. I have, however, submitted a good many specimens to Mr Barrett, and he inclines to the opinion that they are identical.

L. penkleriana.—Common among alder and hazel in July. Varies considerably, some specimens being brightly and decidedly marked, others almost unicolorous.

Phlæodes tetraquetrana.—Common among birch in May, principally over 400 feet. I have one specimen in which the ground colour is almost white and the darker markings of a pale slate colour.

Pædisca sordidana.—Not common. My specimens were beat out of alder at a low elevation.

P. solandriana.—Common at all altitudes. My specimens vary from rich red brown to pale ochreous or slate colour, most having a rich white blotch on the inner margin, others with the blotch much the same shade as the ground colour, but I do not remember ever having seen a specimen with the large dark brown blotch on the inner margin as described by Mr Stainton, or like

Wood's figure, 1027, or Hubner's *semimaculana*, which Staudinger makes *solandriana*. Is this latter a common English form?

P. ophthalmicana.—Locally common at a low elevation on poplar.

Catoptria cana and Scopoliana.—If Mr Barrett is right in his division of the species, which I am inclined to think he is, we have here *cana* and *scopoliana*. See 'Barrett's Tortrices, E.M.M.,' vol. x., page 4. Mr Barrett has seen my specimens and named them accordingly. They seem both common in certain places in June and July.

Halonota bimaculana.—Not uncommon here. I usually take it either on the heather under, or beaten off, birch-trees in August and September.

H. trigeminana.—A very abundant insect on the face of Moncreiffe Hill in June, especially on the dry faces at and over 500 feet.

H. cirsiana.—Locally frequent. Sitting on the herbage or flying in the sunshine in May and June.

H. scutulana (*Phlugiana*).—Not very common, being local. The average size of the males here is 9 to 10 lines. I see Wilkinson gives $7\frac{1}{2}$ to 9, as does Mr Stainton. I cannot see any resemblance between our *cirsiana* and *scutulana*.

H. brunnichiana.—The food-plant is not very common here; but, where it grows in my garden and orchard, I find *brunnichiana* in July and August. I have a female taken at Keir which is nearly unicolorous, the dorsal patch being very slightly paler than the ground colour.

H. tetragonana.—Not common. I have taken a few specimens in the last two or three years among the rose-bushes in the garden, towards the end of June. Mr Barrett informs me that my specimens are unusually dark.

Dicrorampha petiverella.—Plentiful, where and when it occurs; but where I find it one season it is sometimes entirely absent the next. The pale dorsal mark is, as Mr Stainton observes, sometimes divided by the ground colour. It appears here in July.

D. alpinana.—In the few places where the tansy grows here, *alpinana* is commonly to be met with in July.

D. plumbagana.—I have two specimens taken near my house in the end of May, which Mr Barrett has identified for me as this insect: as the members of this family are so much alike, it may be more common than I suppose.

D. plumbana.—Very abundant among old pasture near my house, and among rough herbage by the river side. Varies slightly in size and considerably in shade. Of some pale specimens I sent to Mr Barrett, he writes: "Your specimens agree well with my two *Dicrorampha saturnana*, but I had no idea that it would be found in Scotland. It is very doubtful still whether it is really distinct from *plumbana*." They certainly are very puzzling here, as I find them all flying together, although the *plumbana* form is rather later than what appear to be *saturnana*, the latter commencing to fly in May, the former principally in June.

D. herbosana.—An abundant insect here, and certainly appears to be quite distinct from any of the genus we have here. This, as well as others of the family, has a tendency to albinoism in some specimens.

D. consortana.—This insect is so small and so easily overlooked that I have not obtained many specimens; and as the river bank where I have noticed it is much exposed, I could not find a day sufficiently calm last year to make it possible to see or follow up the smaller tortrices. I have no doubt, however, that in that spot it may be fairly common in July.

Coccyx hyrciniana.—Abundant of course among spruce in May and June. Some specimens are of a rich golden brown, and almost unicolorous.

Capua ochraceana.—Common at an altitude of 500 feet where no hornbeam grows, although there is some stunted beach. At the further end of my hill, where there is a fair quantity of hornbeam, I have never seen a specimen.

(*To be continued.*)

Eupithecia togata and Stigmonota perlepidana.—I have to-day reared a specimen of *Eupithecia togata* from spruce fir-cones, gathered in Moncreiffe shrubbery. I have often gathered these cones before, and have reared *Asthenia strobilella* in numbers, but have never collected them in so fresh a state before. I have no doubt *togata* is here in plenty, but owing to the size and age of the trees, it probably frequents the higher branches in the imago state, as the cones grow more profusely near the tops. It only shows how insects may be overlooked, as I or my boys seldom miss a day in hunting for insects in these grounds. It proves also that the cones must be gathered when newly fallen, if not off the tree, as probably the larva leaves the cone soon after it falls to the ground. I have also found *Stigmonota perlepidana* among *Lathyrus pratensis*, a second proof that this is a food-plant, as you may remember we thought last year at Kinfauns.—THOS. MONCREIFFE.

PHYTOLOGY.

ON CERTAIN LICHENS BELONGING TO THE GENUS PARMELIA.

By JAMES STIRTON, M.D., F.L.S.

(*Continued from page* 254.)

Parmelia reddenda sp. nov.—Similis *P. Borreri* sed medulla (C—vel K—C—). Thallus subtus niger ambitu spadiceus rugosulus rhizinosus, rhizinis nigris, nigricantibus vel etiam interdum pallidis. Sterilis.

Prope New Galloway Scotiæ, a J. M'Andrew lecta.

This lichen resembles exactly specimens of *P. Borreri* (also gathered from the same locality) both in colour and soredioid points. It preserves the same characteristics whatever the stage of growth. It must be closesly allied to *P. negata* (Nyl.), the only recorded description of which is however very imperfect.

Parmelia cuneta sp. nov.—Thallus pallide glaucescens laciniato-dissectus, laciniis inciso-divisis, plerumque margine recurvis et hinc inde nigro-ciliatis, subtus niger, nudus, rugosulus ambitu spadiceus vel fuscescens et sæpe dealbatus ; medulla alba (K—C bene erythrinosa sed C seorsum, erythrinosa saltem leviter) ; apothecia mediocria vel majuscula receptaculo subpedicellato vel elevato ; sporæ 8næ, .02-.028 × .011-.016 mm. Iodo gel. hym. vix tincta, thecæ cœrulescentes, dein sæpe fulvescentes. Spermatia cylindrica recta, .01-.014 × circ. .0006 mm.

Corticola? prope Victoriam, in Africa merid., a cel. G. Thomson lecta.

Parmelia resupina sp. nov.—Similis *P. subrugatæ* (Nyl.) a cel. Krempelhüber in 'Exot. Flecht.,' p. 320 descripta, sed minor et thallus subtus niger rugosulus, raro nigro-rhizinosus et ambitu sæpe dealbatus ; apothecia mediocria receptaculo

pedicellato et tubuloso-protracto; sporæ, .025-.035 × .013-.021 mm.; paraphyses graciles, filiformes, in gelatina firma involutæ apicibus fuscescentibus conglutinatis. Iodo thecæ cœrulescentes cæteroquin gel. hym. non vel vix tincta. Spermatia curvula vel arcuata cylindrica, .006-.0075 × .007-.009 mm. Medulla alba (K—C—)

Ad ramulos prope Knysna in Africa Austral., a D^re^ J. B. Knobel lecta.

Parmelia suffixa sp. nov.—Thallus parvus prostratus pallidus vel pallide glaucescens vel pallide plumbeo-tinctus lævigatus, fere totus laciniato-divisus, laciniis planis radiantibus angustis (latit. circ. .5-1 mm.), sinuato-lobatis, subtus niger ambitu spadiceus, creberriter nigro-rhizinosus, rhizinis sæpe divaricato-divisis; medulla alba (K—C bene erythrinosa, sed C seorsum, leviter vel obsolete erythrinosa).

Ad cortices prope Knysna in Africa Austral., a D^re^ J. B. Knobel lecta.

The colour resembles that of *P. molybdiza* (Nyl.), which has also been sent from S. Africa by Prof. P. MacOwan.

Parmelia euplecta sp. nov.—Thallus pallidus vel pallide virescens adpressulus, interdum sorediiferus, lobato-divisus, subtus niger parce rhizinosus, ambitu fuscescens; medullæ stratum superius, album (K flavescens), inferius, tenue, flavescens vel pallide flavescens (K rubens vel aurantiaco-rubens). Sterilis.

Ad ramulos prope Brisbane (F. M. Bailey) etiam in Bahia (Moseley).

The specimen from Bahia has a paler thallus and is not sorediiferous, but it is very small and not in good condition.

Parmelia nitescens sp. nov.—Thallus pallescens vel etiam pallide cervino-fuscescens, nitidiusculus, laciniatus, laciniis imbricato-depressis sinuato-lobatis, margine planis vel recurvis et tunc sorediosis, punctis albidis minutis (latit. circ. .1 mm.) vel sulcis sorediosis parce adspersis, subtus niger, ambitu spadiceus nudus (quantum video) nonnihil rugulosus; medulla alba (C erythrinosa vel cinnabarina); apothecia et spermogonia ignota.

Supra cortices prope Brisbane (F. M. Bailey).

A NEW SCOTTISH LICHEN.

By J. STIRTON, M.D., F.L.S.

Lithographa Andrewii sp. nov.—Thallus albus vel albidus vel detritus cinerascens (K—C—), crassiusculus (crassit. circiter .5 mm.) ; apothecia parva, primum albo-velata demum erumpentia, nigra, conferta, sessilia vel innato-sessilia, rotundata, oblonga simplicia vel rarius divisa (longit. .2-.5 mm.), epithecio rimiformi demum explanato, margine proprio, prominulo sæpe inflexo ; sporæ in thecis oblongo-pyriformibus infra attenuatis, 8næ sæpissime uniseriatæ incolores simplices, breviter ellipsoideæ vel interdum fere globosæ, uni-nucleatæ (nucleo amplo et persistente), .0065-.011 × .005 -.007 mm. ; paraphyses distinctæ filiformes mediocres apicibus incoloribus et non vel vix clavatis ; epithecium fulvescens; hypothecium incolor. Iodo gel. hym. non tincta nisi lutescens, protoplasma thecarum fulvescens vel leviter fulvescens. Gonidia flavo-virescentia majuscula (diam. .008-.016 mm.)

Ad saxa granitica prope New Galloway Scotiæ, a J. M'Andrew lecta.

The white veil which covers, at first, the apothecia, seems to correspond to what may be termed the epithallus.

GLEN TILT: ITS FAUNA AND FLORA.

By F. BUCHANAN WHITE, M.D., F.L.S.

(*Continued from page* 248.)

THE flora of Glen Tilt is, as may be imagined, tolerably rich. The thick woods and damp rocks that overshadow the lower course of the Tilt have a very luxuriant sylvan vegetation, quite different in its character from that of the upper and woodless part of the Glen. It will, therefore, be well to consider these apart, and to trace the changes in the flora as we ascend from the junction of the Tilt and Garry to the summits of the mountains.

THE FLOWERING PLANTS.

At the mouth of the Tilt the flood gravels have formed flat haughs or terraces covered with a short springy turf and adorned with numerous wild-flowers. Here are to be found various plants which are not usually met with so far inland in the Highlands, such as the Maiden Pink (*Dianthus deltoides*) with its lovely pink blossoms, the soft woolly heads of the Hare's-foot Trefoil (*Trifolium arvense*), the purple flowers of the little Milk-vetch (*Astragalus hypoglottis*), &c. A little further down the Garry, and just outside of our district, *Saxifraga tridactylites*, a very rare plant in Perthshire, occurs along with the alpine *Potentilla maculata*.

On ascending the Tilt as far as Blair Castle, the character of the vegetation will be found to have altogether changed. Here many of the most conspicuous plants have no pretension to be considered as natives, as they have either been purposely planted, or, what is as likely, escaped from cultivation. One of the most striking of these is *Valeriana pyrenaica*, which occurs in great beds on the banks of the Bannavie; and amongst others are *Campanula persicifolia*, *C. rapunculoides*, *Linaria cymbalaria*, *Convallaria majalis*, &c. Soon, however, the naturalised plants disappear and a rich native flora reigns undisturbed. The rarest of all the plants of this, or, indeed, of any part of the Glen, is *Polygonatum verticillatum*, which, though not abundant, still keeps its ground, and is not likely to be exterminated. Few people, I imagine, know the exact places where it grows, and as it has no conspicuous flower it is likely to escape the notice of any one save an enthusiastic botanist, who will probably treat it with due respect.

In the drier parts of the woods *Melampyrum sylvaticum* grows in large beds, the pale-flowered form which I described in this magazine some years ago being nearly as common as the usual darker-flowered form. In the depth of the wood the curious Herb Paris (*Paris quadrifolia*) makes large beds, as does the pretty-flowered but strong-smelling Wild Garlic (*Allium ursinum*) on the banks of the river.

In this part of the Glen ferns of course abound, but only include the common species. On one spot on the banks of the Bannavie is the largest bed of the Oak Fern (*Polypodium dryopteris*) that I ever saw. A steep precipitous bank, 25 or 30 feet high (if not higher), is completely clothed for some distance

with this fern. Then the various wood grasses take their part in ornamenting the banks and rocks. The elegant Melic Grasses (*Melica uniflora* and *nutans*) and the taller *Bromus asper* are among these; while over the Wild Raspberries, St John's-worts, Geraniums, and other plants that form the mass of the vegetation, the Wood Vetch (*Vicia sylvatica*), with its pale and purple-pencilled flowers, twines in an entangled mass.

As we ascend the stream the woods become more open and drier, except in the ravines, and the flora gradually alters. Here occurs a plant that seems otherwise to love the western rather than the eastern side of Scotland—namely, the rare and local *Vicia orobus*. In Glen Tilt it is by no means common, though in one place in the neighbouring district of Rannoch it abounds.

Leaving now the wooded part of the Glen, we enter on the meadows and grassy slopes of the hills—dry and stony in some places, wet and marshy in others. In the marshy and grassy places Orchids abound, and form quite a feature in the scene. All the *Habenarias* (*albida*, *virida*, *chlorantha*, and *bifolia*) occur, while the deliciously-scented *Gymnadenia conopsea* abounds, and the rather rare *Orchis incarnata* is to be found here and there. Along with the latter another rather local plant, *Eriophorum latifolium*, may be found.

The alpine plants now begin to make their appearance. *Saxifraga aizoides* descends, as is its habit, along the river banks, quite to the low country, and is accompanied by *Oxyria reniformis* and *Alchemilla alpina;* but as we get near Forest Lodge these plants get far more abundant, and, except the *Oxyria*, leave the river and grow in every suitable place. The Saxifrage indeed forms large beds in every stony marshy place, where its yellow flowers form in their season conspicuous masses. In marshy places, too, the local *Tofieldia* raises its white flowers; and in drier places *Thalictrum alpinum* and *Carex capillaris* may be found, and in chinks of the rocks beside the river the purple-flowered *Saxifraga oppositifolia*. All these plants, it must be remembered, grow alongside the road at no greater altitude than 900 feet, and are surrounded by a profusion of common lowland wild-flowers —Rock-rose, *Centaurea nigra*, *Polygala*, &c. Apropos of *Polygala*, we find here, in addition to the common *depressa*, the true *vulgaris*—a much rarer plant, with more numerous, larger, and more brilliant flowers.

On the slopes of the hill to the north of Forest Lodge wild flowers of many kinds abound, and in many instances attain a

higher altitude above the sea-level than has been recorded for them. As these altitudes will be duly recorded in the Flora of Perthshire, I will say nothing about them here, but pass on to the alpine plants proper.

Glen Tilt and the Athole mountains generally are, it must be admitted, decidedly poor in alpine plants. Comparing the list of Athole plants with those of the Breadalbane mountains to the west, and of Glen Isla and Clova to the east, one cannot but be struck by the absence of many species. The reason of this is, I imagine, the want of suitable places on the hills; but above all, by the absence of those moist rocks and slopes which so many alpine plants delight in. In a word, the geological conformation of the hills is not favourable.

Of the alpine plants which do occur, one of the rarest and most beautiful is *Veronica saxatilis*, which descends as low as 1600 feet on the high rock overlooking Forest Lodge. Here it abounds in company with *Dryas octopetala*, which descends to nearly 1000 feet, at which height *Poa alpina* occurs. A curious companion of *Veronica saxatilis* in this place is *Chenopodium bonus-henricus* which must have been probably brought in the form of seeds attached to the wool of the sheep which frequent the place, or perhaps blown thither by the wind. The *Chenopodium* can have no pretensions to be considered a native. Another alpine plant, which forms in some places a conspicuous object, is *Cornus suecica*, generally growing along with *Vaccinium uliginosum*. All four species of *Vaccinium* grow in the glen, but as usual *oxycoccos* is rare, and grows in that straggling manner which is so different from its habit in lowland bogs.

A plant reported long ago from Glen Tilt I have repeatedly searched for in vain. This is *Epilobium rosmarinifolium*, which is said to have been found near Pool Tarff, as well as on the banks of the Tilt and of the Tay. That it grew on the latter I quite believe, but only in a garden.

The richest part of Glen Tilt for alpine plants is Ben Chat, and its distinguishing feature is the variety of forms of *Hieracium*. On this hill also *Gnaphalium norvegicum* has been found, though I have not succeeded in discovering it.

The rather rare and local *Pyrola secunda* is not unfrequent in the district, growing almost invariably upon the summit of the steep rocky banks of burns. *Pyrola media* is much commoner, but we do not meet with *P. minor* till we get into the woods near Blair. Another rather local plant which is common, is *Equisetum*

pratense, which grows here and there on the banks of many of the burns, including the Tilt itself.

The mountain lochs have of course their own plants. In the boggy ground surrounding them *Betula nana* grows, and in the water *Isoetes lacustris*, &c., as well as the curious *Utricularia*, which, as I have seen no flowers, I can only suppose to be *vulgaris*. Of the great genus *Carex*, few of the rarer species have been found, the rarest being *vaginata*, which grows on Ben Ghlo. *Carex pauciflora* is exceedingly abundant on many of the hills.

As for the ferns, nothing very rare occurs, the less common alpine species, such as *Polystichum lonchitis* and *Pseudathyrium alpestre*, being far from abundant. All the species of *Lycopodium* except *inundatum* may be found; and *inundatum* has been said to occur near Blair Athole.

The total number of flowering-plants and ferns occurring in Glen Tilt amounts to nearly 350, which, all things considered, is a very respectable allowance.

In the concluding part of this paper the other cryptogamic plants will be briefly noticed.

Mycological Notes—Hypocrea riccioidea, B.—A most interesting discovery has recently been made of the recurrence of a long-lost fungus. The plant, which was growing on dead willow, was forwarded to me in April last by Mr James M'Andrew of New Galloway, and proved to be *Sphæria riccioidea*, Bolt., or *Hypocrea riccioidea*, Berk. It appears that the species has not been found in this country since February 1790. Mr Berkeley has written a note on the subject to the 'Gardeners' Chronicle,' in which he says—

"Both the figure and description of Bolton are, as far as they go, excellent, even to the greenish matter on the older portions of the fungus. It was found, in the autumn of the same year (1790), by Tode, who gives a figure of it, under the name of *Acrosperma lichenoides*, in his 'Fungi of Mecklenburg.' Mons. L'Amy found it near Limoges, and a figure was given from his specimens by Dr Montagne, in 'Annales des Sciences Naturelles' for 1836, who did not, however, identify it with the plant of Bolton. These, we believe, are the only occasions on which this rare and interesting species has been found."

To find a plant after so long a period, and thus to confirm previous observation, is a source of more genuine satisfaction to the Mycologist than even the discovery of new species. Mr M'Andrew has fortunately been able to send me a sufficient number of specimens to admit of its being included in the first fasciculus which will be issued by the Cryptogamic Society of Scotland.—JOHN STEVENSON, Glamis, *May* 1878.

Cryptogamic Society of Scotland.—The next Annual Conference will be held in Edinburgh about the beginning of October. Those interested may learn further particulars from the local secretary, Mr J. Sadler, Royal Botanic Garden or from the Editor of the 'Scottish Naturalist.'

GEOLOGY.

THE GOLD-FIELD AND GOLD-DIGGINGS OF CRAWFORD-LINDSAY (LANARKSHIRE).

By W. LAUDER LINDSAY, M.D., F.R.S.E., F.L.S.

(*Continued from page* 268.)

FROM the beginning of the twelfth century down to the present day, feu-charters and other legal documents affecting landed property in Scotland have made frequent reference to—contain clauses regarding—possible "*gold mynes*" in or under the lands which they describe. The earliest official or documentary notice extant of the gold-mines of Scotland is a grant, of date 1125, by David I. of a gold-mine in *Fifeshire*. This is an illustration of the fact that allusions to gold-mines are frequently made in the charters of lands that do not contain gold,—never did contain it. Fifeshire is not an aurifeous area, though it was in 1852 the scene of a veritable gold-digging and gold mania—known as the *Lomond diggings*,[1] on the eastern bank of Loch Leven—the precious metal being represented on that occasion by a grosser, commoner ore that has often deceived the unwary—*Iron pyrites*.[2]

On the other hand, the latest allusion I have seen made to the gold-mines of Scotland has been the case of "the *Breadalbane* gold and silver mines," which have been more than once before the Court of Session during the last few years. Their ownership was the subject of dispute between the present Earl of Breadalbane, pursuer, and the judicial factor on the trust-estate of the late Marquis, defender; an "action of declarator and reduction"

[1] Described in the 'Transactions' of the Geological Societies of Edinburgh for 1870, and of Dublin for 1871.

[2] Calvert gravely informs us, however (p. 164), that, "on the statement of mineralogists, gold is now found in the *Fifeshire* mountains."

having been raised relative to a Crown charter of 1742.[1] This is a very different case from the Fifeshire one, for Breadalbane is unquestionably an auriferous area; and how valuable its gold-mines are or may yet become may be gathered from what I stated concerning the gold-field of Breadalbane in a paper on "The Gold and Gold-Fields of *Perthshire*," printed in the 'Proceedings of the Perthshire Society of Natural Science' for 1870.

In 1867 the Geological Society of Edinburgh took much interest in the subject of the gold-mines of Scotland, and the nature of these mines in relation to Crown or other grants of gold-mines, or to the references to such gold-mines in legal, historical, or archæological works. It so happened that the then secretary of the Society was a lawyer, the late Thomas Wallace, S.S.C., while another of its most energetic and accomplished members belonged to the same profession, the late James Haswell, W.S. In December 1867 Mr Wallace thus wrote to me: "In the course of the discussion on your paper on 'The Gold-Fields of Scotland,'[2] Mr James Haswell mentioned that, in examining an entail, dated in 1693, he had found a reference to gold-mines. I asked him to give me an excerpt from the deed, which he has now done, and which I have the pleasure to enclose." The said excerpt, which follows, is interesting as illustrating—1, The common practice of lawyers, from the twelfth century downwards, of inserting what may be described as *gold clauses* in deeds affecting land in Scotland; and 2, The doing so in cases where there was neither proof nor likelihood that gold actually existed or had ever been found.

Extract from Deed of Entail executed by William 3d Duke, and Anne, Duchess, of Hamilton, dated 3d October 1693. Recorded in the Register of Taillies 4th July 1694:—

"Together with all and sundry *mynes* of gold and silver lieing within the bounds and Barrony of *Lesmahagow*, or any part thereof, with full power, privilege, and liberty, to dig doun and win shanks and vaults in any part or parts of the said Lands and Barrony forsaid, sinks, passages and all other Meins and Instruments to use for working and wining of the said Mines and Mineralls. . . .

"All and haill the lands of Kinglass with manor place, houses, biggings, yards, orchyards, doves, dowcoats, coalls, coallheughs, coall parts, pendicles

[1] The evidence in the case was fully reported in the 'Daily Review' of February 16 and June 16, 1875.

[2] Published in the 'Transactions' of the Society for 1868, and in those of the Irish Geological Society for 1869.

and pertinents thereof whatsomever lying within the Lordship and Barronie of Jedburgh and Sheriffdome of *Linlithgow*, with all and sundry *mynes* of gold and silver, tinn, lead, copper, and other metalls whatsomever within the said bounds of the said lands of Kinglass, with power to dig and sett doun shanks and vaults within any part thereof, with sinks, passages, and all other Meins and Instruments to use for working the said mynes and mineralls, And to use and dispone thereupon, And with liberty of fineing and refineing and transporting the same over seas (*except* the gold and silver)."

Neither Lesmahagow (Lanarkshire) nor Linlithgow is an auriferous area, geologically speaking, though various unconfirmed or unproven statements have been made concerning the finding of gold in both areas.

Thus Calvert tells us (p. 160) that "in 1620 the gold and silver mines of *Lesmahagow* were bestowed on the Marquess of Hamilton, and in thirty days afterwards eight pounds of native gold were brought to the mint, besides what the workmen got." A much more extraordinary statement, however, is that which he makes concerning *Linlithgowshire* (p. 164). "This county," he affirms, "is one of the chief gold regions of Scotland. . . . As early as the reign of Queen Mary I. of Scotland, in the sixteenth century, the mines were worked here—said to be near Linlithgow, but which is not certain: and one of the partners of these mines gave to the Regent, Earl of Morton, a bowl made of gold, capable of containing a gallon, and which was filled with coins, likewise of gold, the produce of the mine." The same story, however, has already been told on the authority of Mr Fittis in connection with the native gold of Crawford Moor—that is, Lanarkshire.[1] Calvert further states (p. 164) that "a gold locality, lately identified in Linlithgowshire, is in the *Bathgate* Hills on the borders of Edinburghshire."[2]

In 1424, James I. passed an act at Perth relating to gold-mines in Scotland—an important one, in so far as its influence extends to the present day. Our latest standard Encyclopædia — the 'Globe Encyclopædia'—during the present year (1878) tells us that "in Scotland, by the statute of 1424, gold-mines are declared

[1] *Vide* p. 258 of present series of papers in the 'Scottish Naturalist.'

[2] In a prospectus of the Hilderston Hill Silver Mining Company, issued in 1873, we are told that "the leases include *gold*, silver, copper, tin, lead, nickel, arsenic, sulphur," &c. But my friend Andrew Taylor, F.C.S., mineral surveyor and lecturer on mineralogy, Edinburgh, who is both a native of Bathgate and familiar with the geology and mineralogy of his native county and their literature, informs me (in a letter of date April 1878) that he knows of no proper evidence of the existence of gold in Linlithgowshire at all, either now or at any previous time.

BIOLOGICAL LA... WOODS HOLE

to *belong to the Crown* without limitation." Hence the common exception of gold-mines in the conveyance of landed estates; and hence also the vexatious *royalty* or tax that proved so great an obstacle to the development of the Sutherland diggings of 1869.

But the term *gold-mine* would appear to be of *prehistoric* origin in some parts at least of Scotland. It is, at all events, not confined to old Crown-grants or feu-charters—to historical or antiquarian works. It is incorporated with the very soil or skeleton of the land itself. Thus one of our foremost Gaelic scholars, who is, moreover, a geologist, and a describer of the Sutherland gold-field—J. F. Campbell of Islay—as well known for his 'Frost and Fire' as for his 'Tales of the West Highlands'—tells us that one of the hills in Sutherland—from which the auriferous Helmsdale water takes its rise—is called *Ben-ormen*, or, more properly, *Beinn-orm-mein*—that is, the Hill of the *Gold-mine*.[1]

Let us see now what grounds exist for speaking of or writing about gold-*mines* in Scotland.

We have to consider, in the first place, the evidence presented by medieval records, showing apparently that veritable gold mines and gold-mining existed at one time in the Crawford district of Lanarkshire. It has already been stated (p. 259) that Bowes erected a *stamping-mill* on the Longcleuch Burn; and it now falls to be considered what this implies. Atkinson (as quoted by Calvert, p. 146) declares it to be "most true that Mr *Bowes* discerned a small *vein* of gold, which had much small gold in it, upon *Wanlockhead*. . . . Mr Bowes swore all his workmen to keep it secret and never discover it to the Scotch King or his Council; for so he had promised to do to the Queen of England, on whose letter he had a warrant from the Scotch Lords to dig and delve where he would. . . . Mr Bowes digged several *shafts in solid places* in the mountains, in Robertsmoor, and in Wanlockhead. . . . He returned and told the Queen of England that he had performed and concealed his trust: that he had found a small vein of gold." Of *Bulmer*, Atkinson says: "From Shortcleuch he removed up the great hill to Longcleuch Head, to seek gold *in solid places*, whereof he discovered a small spring; but there he wanted a water-course to help him. This *vein* had the sappar-stone[2] plentifully in it, which some-

[1] 'Something from the Gold-Diggings in Sutherland,' 1869, p. 17.

[2] Which he describes as "brown spar, somewhat like sugar-candy" (Calvert, p. 149). Probably this was simply a brown-coloured or ferruginous quartz—not the brown spar of modern mineralogists.

times held natural gold. But the salmoneer-stones[1] in that vein at Longcleuch Head held much silver. . . . It is said that vein was *powdered with gold*. . . . It was a vein, and not a bed." But though he says it was "not a bed," he goes on to speak of two nuggets at Longcleuch Head, of 6 oz. and 5 oz. weight respectively, which were "thought to descend from the gold-bed."[2] The working of his stamping-mill at the same place must have been successful, as we are told that, by its means, Bulmer "used to get much small mealy gold"—in the condition, that is, in which he must have got it from crushed or powdered quartz, when the process of mercurial amalgamation was unknown. The brown spar of Longcleuch Head is also described as auriferous—a lump of 2 lb. troy containing "an ounce of pure gold."[3]

The expression, a *vein of gold*, so far from being conclusive that auriferous quartz was meant thereby, is one that is sometimes used even at the present day—loosely and incautiously, no doubt—in reference to drift-deposits of nuggety or granular gold on the bed rock. But the reference to a *stamping-mill* is much more conclusive, seeing that stamping or crushing in the gold-mining of the present day is required only where there are auriferous *rocks* to crush or reduce to powder. The sinking of "shafts in solid places"—that is, in the solid rock—also points to genuine mining of the Silurian slates of the district for auriferous quartz.

Atkinson (Calvert, p. 149) says, that "at Longcleuch Head Mr *Bulmer* made a *stamping-mill* called abroad Anacanago. Such are used in the West Indies and in Cornwall, where it is sometimes called a plash-mill, to dress tin out of *stones*, in which the eye can discern little or nothing." This mill was probably connected with what Atkinson speaks of as a "buddle" (Calvert, p. 148)—a term still applied to a similar machine used in the reduction to powder of Cornish tin.[4]

The parallelism between gold and *tin* is one of such interest that it deserves a special notice.[5] Like gold, tin occurs in nature—in Cornwall, for instance—in two conditions: (1) as *mine*-tin, disseminated through veins, lodes, or gangues of quartz or other

[1] From his allusion to their being argentiferous, he may here refer to Galena.

[2] Calvert, p. 148.

[3] Ibid., p. 149.

[4] Two figures of this *buddle* are given in the article "Tin" in Chambers's Encyclopædia.

[5] Calvert, moreover, tells us (p. 190) that gold is associated with tin-stone at Leadhills.

rocks or minerals, and requiring to be separated, first by being "stamped to a very fine powder," by some species of stamping-mill or rock-crushing apparatus, and then washed or dressed by the *buddle;* and (2) as *stream*-tin—the result of the disintegration of stanniferous granite or other rocks—requiring only to be washed out of alluvium or drift.

It would appear, however, that the stamping-mill and the buddle have no necessary connection; so that, in Cornwall, the one is sometimes used without the other—the buddle without the stamping-mill—and that, while the stamping-mill implies rock to be crushed, the buddle may imply only alluvial deposits to be washed. This was, no doubt, the case also in the gold-diggings of Crawford in the sixteenth century—so that, when a stamping-mill is spoken of, our legitimate inference is that there was auriferous quartz to be crushed; while the buddle may have been used to wash the drift, or the powdered auriferous quartz, or both.

According to Calvert (p. 136), the Cottonian Reporter affirms that "gold may [*be seen*] dispersed in certain black rocks of chiver"—that is, in all probability, in Silurian slates.[1] But what the very same Reporter really says—according to Mr Cochran Patrick—is this: "Gold *maye lye or growe* dispersed in certeyne blacke rocke of chevere."[2] By what would appear to be an interpolation of Calvert of the words "be seen," the Cottonian Reporter is represented as making an assertion concerning auriferous quartz or slates as *actually* existent; whereas the Reporter's own words, as given by Mr Patrick—"maye lye or growe"—point only to the *possible* existence of such quartz or slates. And this is a suggestion illustrative of the way in which errors are apt to arise, from the quotation by different writers, of varying competency for the deciphering and interpretation of ancient manuscripts, of the same old chronicles. Where the wish is father to the thought, what are represented originally as

[1] While it is possible, with considerable confidence, to give the modern synonyms of some of the minerals mentioned by old chronicles as being associated with gold (*e.g.*, keele), there are others whose modern synonymy cannot probably be determined. Thus we cannot say what is the "bright-black saxcer-stone, reddish, which in Scotland engendereth gold" (Calvert, p. 155). Nor do we know exactly what is meant by "Brimstone" (Calvert, p. 136).

[2] Introduction to Mr Cochran Patrick's 'Records of Mining in Scotland,' p. xxii.—not yet published. I am here indebted to that author for the use of a proof of this description of the Crawford mines by the Cottonian Reporter

mere *possibilities*, are apt to be quoted, by one author after another, as actual *facts;* and the natural consequence is, that all inferences based upon these supposed facts are simply worthless. I cannot doubt that there has been not a little of this loose or erroneous quotation from ancient records [1] concerning the gold-fields of other parts of Scotland, as well as of Lanarkshire and Dumfriesshire.

One other illustration of the variety of quotations of the same text, and of the effects of this variety, must here be given, because it is intimately connected with certain calculations as to the value of the gold-produce of Crawford, already given (at p. 264). According to Mr Dudgeon, the Cottonian Reporter states that certain "valleis have (yielded) therein of greater value than one hundred thousand pounds *y(early)*." [2] Dr Porteous repeats this, *in ipsissimis verbis* [3] — no doubt copying from Mr Dudgeon's pamphlet of 1875. But Calvert's version runs thus (p. 135): "Valleys have (yielded gold) therein of greater value than one hundred thousand pounds; (yet by the) people working for gold," and so forth. The correctness of his version is shown by the original text as given by Mr Cochran Patrick,[4] which is as follows: "Valleyes have byne washed and gold gotten thearein of greater vallue then one hondred thousand poundes, yet in so many yeares, and so many people workynge for goulde no vaynes of gold have byne knowne to be founde." In other words, according to Dudgeon and Porteous, the *annual* yield of gold was £100,000 worth; while, according to Calvert and Patrick, this amount of gold was yielded only in eighty years. At the time when I made the calculations already given (at p. 264), I had before me only three of the foregoing versions of the Cottonian Report — the original text of Mr Cochran Patrick not having reached me till April (1878). Finding Mr Dudgeon and Dr Porteous to agree in representing the yield as an *annual* one, and believing their version—given in 1875 and 1876—likely to be more correct than Calvert's—given in 1852—I based my calculations on the supposition that there was, for eighty years, an *annual* yield of £100,000 worth of gold. It proves now, however,

[1] Comparing, for instance, the various versions given by Calvert, Porteous, Dudgeon, and Patrick, of the narratives of the same old chroniclers—the Cottonian Reporter and Atkinson—I find the most surprising discrepancies.

[2] Paper in the 'Mineralogical Magazine,' p. 24.

[3] 'God's Treasure-House,' p. 35.

[4] Introduction to his 'Records of Mining,' p. xxi.

that Calvert's is, in this instance at least, the more correct version; and it follows that the calculation given must be divided by eighty, which will give a mere bagatelle of a gold-yield: for even in current coin £100,000 worth of gold in eighty years—or an annual average of £1250—would be an insignificant yield, considering that the produce of the Sutherland diggings in 1869, in a few months, from the surface-soil merely, was variously estimated at £12,000 to £25,000, or that the gold export of our single colony of New Zealand, in the year 1877, was 1½ millions worth; and considering, further, that neither in the case of Sutherland nor New Zealand does the quantity reported to the authorities, as exported or collected, represent more than a varying proportion of the total actual yield. There is, on gold-fields of whatever size and wherever situate, always much gold that gets into private hands, much that is exported surreptitiously or illegally, without payment of duty, or entry in the books of the Customs authorities or of other public statisticians.

The stamping-mills of Bowes and Bulmer appear to have been *facts;* and it is a legitimate *inference* that they were used for crushing auriferous quartz, and that this quartz was found in veins or lodes in the Silurian slates. Unfortunately, however, the writings of the Cottonian Reporter and of Atkinson contain what are apparently very positive assertions, that *no such veins* have ever been found in the Crawford district.

In the first place, the Cottonian Reporter, according to Calvert (p. 135), states that, though sometimes as many as 300 gold gatherers were at work, and though the works had gone on in the reigns of James IV. and James V. continuously for eighty years, "yet by the people working for gold *no veins* of gold have been found." Again, though adits of 120 fathoms in length or depth were occasionally driven, "yet *not any veins* of gold have been known to be found." Notwithstanding that veins of copper and lead were come upon, "the workmen have *not found any known veins of gold.*" Nevertheless he is perfectly sanguine as to the existence of veins of gold in the district, and he gives at full length six reasons or grounds for his belief.

Were this series of papers in the 'Scottish Naturalist' of a historical or archæological character, it would be interesting, and even amusing, to discuss these reasons of the Cottonian Reporter, illustrating, as they do, the curious mining lore of the day with all its fables, and now to us unintelligible jargon. But our object is to get at facts showing the nature of the gold-mining of the

sixteenth century,—at facts showing whether, at that time, *gold-quartz*—as well as alluvial gold—was found and worked.

The Cottonian Reporter complains both of the ignorance and apathy of the miners in not looking for this auriferous quartz where it was likely to occur: and the justness of his complaint is supported by Atkinson, who tells us, for instance, that the miners of Cornelius De Vois "never sought gold *in solid places*, . . . never sought on high hills or solid places for a *bed or vein* of gold"[1] But Atkinson, too, had his own strong conviction that gold-quartz was to be found if properly searched for. "These brows or braes," he says, "are likely to turn rich if diligently sought, and the *vein or bed* is not far from the gold gotten in the valleys.[2] There is," he affirms, "much natural gold commonly found near the river sides, washed from the *veins or bed* in mountains."

The Cottonian Reporter has the same idea, that the nuggets found in the valleys were washed or worn out of veins of gold occurring high up on the hills.[3]

Atkinson says of Bulmer, "By help of a water-course he got much straggling gold on the skirts of the hills and in the valleys, but *none in solid places.*"[4] Nuggets are "supposed to descend from the bedd of gold: but *no bedd* as yett thereof was found thereat."[5]

The word "ore" is sometimes used by the old chroniclers; and we are told of its having been sent abroad to be "fined" or "refined." The term may have been applied equally to nuggets or gold-quartz, or both—or even to auriferous brown or other spars, rocks, or minerals.[6] But in all probability it was applied usually, if not always, to nuggets. Thus Queen Mary of Guise "was presented with a piece of *ore* weighing 3 oz." (Fittis). This is not likely to have been other than a nugget.

The term "shaft" is another that, like so many, is equally applicable to the excavation of loose and solid material—of clay or of rock. Up to the present day the sinking of shafts is spoken of in the surface soil. Thus Dr Porteous tells us (p. 50) that in 1863 the Leadhill miners sank a "shaft"—probably in the till—at the head of the Longcleuch Burn, where "the *débris* is above

[1] Calvert, pp. 144, 145. [2] Ibid., p. 154. [3] Ibid., p. 138.
[4] Ibid., p. 148. [5] Porteous, p. 42.
[6] There may be in the Crawford district, as there are in other auriferous countries, *auriferous metallic sulphurets*, especially the pyrites or blendes of iron, lead, copper, or zinc.

15 feet deep, the whole of which produces more or less gold—on an average 5 grains per cubic yard of earth."

In the accounts given both by the anonymous Cottonian English [1] Reporter and by Atkinson of the operations of the Crawford gold-mines in the sixteenth century, constant reference is made to *washing*, scouring, water, water-courses, dams, sluices—all pointing, apparently, to the separation of mere alluvial gold from the clays, sands, or gravels in which it is imbedded, though the use of such expressions is quite compatible also with the separation of gold grains from powdered quartz, slate, or other rocks.

Atkinson says that "their usual manner is, when they seek for gold in combes and valleys, to frame or make a long sough or scouring-place, into which they bring the stream-water to scour away the light earth from the heavy sandy earth, and to cull away the great stones from the heavy sand; which sand or heavy earth they scrape into their troughs or trays, and by straining it, and by washing the same often, there is found both rain gold, flat gold, pale gold, and black gold." [2] "Bulmer," he says, "brought home a water-course there to wash and scower the natural gold from the earth that had before been descended from the mountains ever since Noah's flood." [3] This is just the principle and practice of gold-washing in its simplest form, as adopted on the alluvial diggings of all auriferous countries in all ages.

Amid the conflict or cloudiness of the evidence adduced, it cannot be held or *proven* by ancient records that gold-quartz was ever worked in the Crawford district, though the *probability* is that it was. Unquestionably there is not one tittle of evidence to show that gold-quartz was found containing gold in quantity visible to the naked eye—gold-quartz comparable to the Gemmell specimen now in the Museum of Science and Art, Edinburgh.

Nor, it must be added, has modern research brought to light any such auriferous quartz as constitutes the staple of *museum* examples of Wanlockhead gold-quartz. In other words, no piece of gold-quartz so streaked with gold as is represented

[1] His *English* origin would be obvious from his phraseology alone: for instance, his frequent use of the term "gylle" (gill) as a synonym for a small mountain stream—such as in Scotland is known as a *burn;* just as Atkinson's nationality is also pointed out by his use of such terms as "combes" for *glens*.

[2] If by "black" be simply meant dark-coloured, his term is intelligible; otherwise I do not know what he means by "black gold."

[3] Porteous, p. 41.

in the lithograph published by Mr Dudgeon in 1876, has ever been found *in situ*—or in such circumstances as admitted of no doubt as to its local nativity.

This is not, however, tantamount to saying that auriferous quartz does not exist in the Crawford district. On the contrary, I have deliberately expressed my opinion that it probably does;[1] and I have done so in spite of the cautions and jokes—if not sneers and sarcasm—of those who, not many years ago, pinned their faith to the deliverance of Messrs Greg and Lettsom,[2] and who went so far as to deny the existence in Scotland at all of native gold in any form, even in that of grains or nuggets. But an opinion is not a fact, though facts of a certain kind are not wanting to show that gold-quartz occurs nowadays about Wanlockhead, and may be had for the looking.

Unfortunately, though represented as being abundant, I have never seen a specimen of it either in any public museum or in any private collection, and this, though the Wanlockhead lead-miners are perfectly aware, and have long been, of the demand there is in mineralogical cabinets for the gold produce of their district in all its forms. The mere assertion that it occurs, especially when the assertion is intemperate and intolerant—to characterise it very mildly—will certainly not carry conviction to those familiar with gold-fields and gold-miners.

The Rev. Thos. Anderson, minister of the parish of Crawford, writing in 1845 the account of his parish for the 'New Statistical Account of Scotland,'[3] stated that at Leadhills gold is "disseminated in minute particles through the till or clay more immediately covering the rocks, and also occasionally *interspersed in quartz*."

Professor Harkness of Cork—a native of Dumfries, and well

[1] *Vide* what I said of "The Auriferous Quartzites of Scotland" in the 'Scottish Naturalist,' vol. iii., 1876.

[2] I refer to the following statement made at p. 238 of their 'Manual of the Minerals of Great Britain and Ireland' (1858) :—

"It is a *well-known fact* that much of the gold *said to be* now found at the Leadhills, and which commands a patriotically high price, is *conveyed thither from Glasgow* to be *rediscovered* at a home locality."

I recently wrote to Mr Greg, asking the grounds on which he made so strong a statement. His reply, of date March 1878, was, "I cannot now recollect my authority for the statement that the above locality was *salted*—as they say in America—from Glasgow." Whether well founded or not, however, the imputation herein contained does not apparently or necessarily affect the veracity or integrity of the miners of Leadhills and Wanlockhead.

[3] Vol. vi., p. 336.

acquainted with the geology and mineralogy of his native county —discoursing in 1852 on "The Gold Districts of Wanlockhead and the Leadhills," thus described the mode of "occurrence of gold in the lower Silurian rocks. It is found disseminated in small foliaceous particles or in round grains *in the quartz veins* which traverse the Greywacke sandstone and shale in a direction generally at right angles to their strike, and also in the detritus of the same rock. A specimen weighing 240 grains was lately found. The district furnishing the gold lies to the north of the zone of black slate which runs from Stobo through the summit-cutting of the Caledonian Railway and Glenochar in the direction of Cairn Ryan. It is greatly disturbed, not only by the quartz veins, but by dykes of felspar and greenstone, and the dip is the reverse of that which usually prevails. Mr Harkness believes that the occurrence of gold is not connected with any particular portion of the Silurian series, but rather with the presence of the quartz-veins and the influence of the plutonic rocks."[1] Were not this quotation taken direct by myself from the pages of a scientific quarterly containing the published proceedings of a scientific society, I should have great doubts as to its correctly representing the Professor's opinions. There is here, at all events, a decided representation of the existence of *auriferous quartz in situ* as a familiar fact. Unfortunately he does not tell us whether the "particles" or "grains" referred to are ever visible to the naked eye, and whether the "specimen" spoken of was a nugget.

The Rev. Dr Porteous of Wanlockhead, in his topographical work published in 1876, gives various instances of gold-quartz *in situ* (p. 53). Nevertheless, he says incautiously (p. 61) that "a *gold-quartz vein* in Britain, except in North Wales, has *not as yet been found*, though eagerly sought for." And quite recently in one of the Glasgow newspapers, Dr Wilson of the same village alludes to, but does not describe, his own discoveries. He says: "I am prepared to prove that much of the quartz in this district is auriferous, and I have a specimen in my possession with both gold and quartz visible to the naked eye. . . . That quartz is to be found in the locality with gold running through it is now established. I and two other men found it. . . . I have settled, beyond dispute I believe, that gold-quartz is found *in situ*. . . . This stone also contained gold visible to the naked eye, and seen by six people. . . . Gold in quartz,

[1] 'Quarterly Journal of the Geological Society,' vol. viii., 1852, p. 396.

visible to the eye, is, and has been, frequently found both here and at Leadhills, and a small nugget intimately mixed is in the possession of Mr Noble, Leadhills. . . . It is beyond doubt that auriferous quartz has been found in Wanlockhead by myself and others."[1]

On the other hand, Mr Dudgeon of Cargen, who is a resident proprietor in the county of Dumfries, and has written specially "On the Occurrence of Gold in the South of Scotland," tells us that "it is only very rarely that gold has been found in this district *in the matrix*—i.e., *in vein-quartz;* and then it has only been obtained *in detached pieces, and never in situ.* The auriferous vein of quartz mentioned in Atkinson's 'Discouverie and Historie' has never been refound, though doubtless auriferous veins must exist somewhere in the locality."[2]

As I have already shown, the Director of the Geological Survey of Scotland, who is also Professor of Geology and Mineralogy in the University of Edinburgh, up to 1874 either ignored or denied the existence of auriferous quartz at Wanlockhead or Leadhills.[3] But his opinion must recently have undergone a complete revolution, in so far as we find him stating at the Royal Society of Edinburgh in March (1878), in reference to the Gemmell specimen of gold-quartz in the Museum of Science and Art there, that it represents or belongs to the rocks of the district in which it was found. "Professor Geikie had no difficulty whatever in saying that the quartz in question was native to Wanlockhead, despite the coincidence that it was discovered immediately after the famous flitting of the Laidlaws;"[4] and again, "Professor Geikie expressed agreement with those who believed that the specimen was Wanlockhead quartz."[5]

Lastly, Calvert says (p. 169), "I found . . . a small specimen in quartz in Wanlockhead mine"—meaning the lead mine, no doubt.

[1] 'North British Daily Mail' of March 13 and 19, 1878.

[2] Paper in the 'Mineralogical Magazine,' vol. i., 1876, p. 27.

[3] *Vide* footnote to p. 212; as well as p. 53 of paper on "The Auriferous Quartzites of Scotland," 'Scottish Naturalist,' vol. iii., 1876. In a letter, of date December 1874, he informed me that "the Geological Survey has not yet met with any of the auriferous quartzites of Scotland."

[4] 'Daily Review' of March 5, 1878.

[5] 'Scotsman' of same date.

NEW BOOKS.

THE Rev. J. Stevenson, of Glamis, so well known for his investigations amongst fungi, announces a work on the 'Fungi of Scotland,' to be published by subscription, if he meets with sufficient encouragement. Mr Stevenson purposes giving a complete list of the Scottish fungi, with their distribution, &c., as far as known, and descriptions of the species new to science which have recently been discovered. The distribution will be illustrated by a descriptive map, and as the price is only 7s. 6d., we hope that the author will get support enough to enable him to carry out his intention. Names may be sent to the Rev. J. Stevenson, Glamis, Forfarshire.

Dr B. Carrington (assisted by Mr W. H. Pearson) has recently published a first fasciculus of dried specimens of British Hepaticæ, including about sixty species, many of them Scottish. The name of Dr Carrington is sufficient to indicate the value of the collection; and many botanists will, no doubt, be glad to avail themselves of this opportunity of obtaining authentic specimens of an interesting though rather neglected class of plants.

Hemipterologists will gladly welcome the appearance of the first volume of Dr O. M. Reuter's 'Hemiptera Gymnocerata Europæ.' Europe, in a wider sense than the merely geographical, forms the field of Dr Reuter's labours, and the species are described with the care and perspicuity which are eminently characteristic of the author. The work is printed at Helsingfors by the Société Finlandaise de Litérature, and is illustrated with eight plates (seven of them coloured), whose execution leaves nothing to be desired. The present volume is devoted to the division Plagiognatharia of the subfamily Capsina, and its issue will mark an era in the study of the European Hemiptera. The succeeding volumes will be anxiously looked for.

Rook-literature.—Mr Yarrell, in his account of the Rook, first published in 1839, says that the experiment of extirpating the species "was made a few years ago in a northern county," but that "the farmers were obliged to reinstate the Rooks to save their crops. The subject was facetiously commented upon in a pamphlet by James Stuart Menteath, Esq. of Closeburn." I have tried in vain to see this pamphlet, and I shall be extremely obliged to any readers of 'The Scottish Naturalist' who will lend me a copy, or at least inform me where I can find one.—ALFRED NEWTON.

MAGDALENE COLLEGE, CAMBRIDGE.

INSECTA SCOTICA.

THE LEPIDOPTERA OF SCOTLAND.

(*Continued from page* 273.)

EDITED BY F. BUCHANAN WHITE, M.D., F.L.S.

SOBRINATA Hb. Common. Amongst juniper. Ascends to 1400 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ West-Ross o

LAT. 54°40′-57°40′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. August, September. LARVA. May, June. FOOD-PLANT. Juniper.

PUMILATA Hb. Local. Ericetal. Ascends to 1700 feet.

DISTRIBUTION—EAST. ♀ ♀ Tay Dee Moray o o o
WEST. Solway Clyde Argyle ♀ West-Ross o

LAT. 54°40′-57°40′. RANGE IN EUROPE. Southern and western; central and northern, in part. TYPE. Meridiono-occidento-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. August, September. FOOD-PLANT. Flowers of many low plants.

EUBOLIIDÆ.

ANAITIS Dup.

PLAGIATA L. Common. Pascual and ericetal. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀
Orkney ♀
WEST. Solway Clyde ♀ West-Ross o

LAT. 54°40′-59°10′. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-August. LARVA. September-May. FOOD-PLANT. *Hypericum*.

CARSIA Hubn.

PALUDATA Thnb.; var. *imbutata* Hb. Local. Ericetal. Ascends to 1400 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀♀ Orkney o

WEST. Solway Clyde ♀ West-Ross o

LAT. 55°-59°10′. RANGE IN EUROPE. Lapland and Finland (the type), Alps, Scotland, N. Germany, Norwegian Mts., &c. (the variety). TYPE. Septentrional. TYPE IN BRITAIN. Scottish.

TIME OF APPEARANCE—IMAGO. July, August. LARVA. June. FOOD-PLANT. *Vaccinium vitis-idœa* and *oxycoccos*.

EUBOLIA Dup.

LIMITATA Sc. (1763); *mensuraria* Schiff. (1776). Common. Pascual. Ascends to 1200 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee ♀♀ Sutherland o o

WEST. Solway Clyde ♀ West-Ross o

LAT. 54°40′-58°30′. RANGE IN EUROPE. Nearly throughout. TYPE. European. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June-August. LARVA. May. FOOD-PLANT. Grasses.

CERVINATA Schiff. Local. Hortensal.

DISTRIBUTION—EAST. Tweed Forth Tay o o o o o

WEST. Solway Clyde o o o

LAT. 54°40′-56°30′. RANGE IN EUROPE. Britain, France, Holland, Germany, Finland, &c. TYPE. Occidento-central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. September, October. LARVA. June, July. FOOD-PLANT. Mallow and hollyhock.

PLUMBARIA F. Common. Pascual and ericetal. Ascends to 1400 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀♀ o o

WEST. Solway Clyde ♀♀ o

LAT. 54°40′-57°40′. RANGE IN EUROPE. Central, &c. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. April, May. FOOD-PLANT. Heather, &c.

MESOTYPE Hb.

VIRGATA Rott. (1777); *lincolata* Hb. (1787). Rare.

DISTRIBUTION—EAST. o o Tay o o o o
WEST. o o o o o

LAT. 56°30′. RANGE IN EUROPE. Central, &c. TYPE. Central. TYPE IN BRITAIN. English.

TIME OF APPEARANCE—IMAGO. May-July. LARVA. September-May. FOOD-PLANT. Bedstraw.

CHESIAS Tr.

SPARTIATA Fuesl. Common. Amongst broom. Ascends to 1100 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde ♀ o o

LAT. 54°40′-57°40′. RANGE IN EUROPE. West-central, &c. TYPE. Occidento-central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. September, October. LARVA. June. FOOD-PLANT. Broom.

RUFATA F. (1775); *obliquaria* Bkh. (1794). Locally common. Amongst broom. Ascends to 1100 feet.

DISTRIBUTION—EAST. ♀ ♀ Tay Dee Moray o o o
WEST. Solway Clyde ♀ o o

LAT. 54°40′-47°40′. RANGE IN EUROPE. Central, &c. TYPE. Central. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. May-July. LARVA. August. FOOD-PLANT. Broom.

SIONIDÆ.

ODEZIA Boisd.

ATRATA L. (1758); *chærophyllata* L. (1767). Common. Pascual and nemoral. Ascends to 1400 feet.

DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray ♀ o o
WEST. Solway Clyde Argyle ♀ o

LAT. 54°40′-57°40′. RANGE IN EUROPE. Central and northern. TYPE. Centro-septentrional. TYPE IN BRITAIN. British.

TIME OF APPEARANCE—IMAGO. June, July. LARVA. May, June. FOOD-PLANT. *Bunium* and other *Umbelliferæ*.

NOTICE.—*The list of the Macro-lepidoptera having been now completed, it is my intention to notice, before proceeding with the Micro-lepidoptera, any addition, either in species or localities, to the list just finished, and with that object shall be very glad to receive information, however little, from any one who can give it.*—F. B. W. W.

THE COLEOPTERA OF SCOTLAND.

(*Continued from p.* 276.)

EDITED BY D. SHARP, M.B.

RUFIPES Fab. Local. In carcases.
DISTRIBUTION—EAST. Tweed ♀ o o o o o o
WEST. Solway ♀ o o o o

VIOLACEUS L. Local. In carcases.
DISTRIBUTION—EAST. ♀ ♀ Tay Dee Moray o o o
WEST. Solway ♀ o o o

LYMEXYLONIDÆ.

HYLECŒTUS Kies.

DERMESTOIDES Fab. Highland. Rare. In stumps of Scots fir.
DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o o

PTINIDÆ.

PTINUS Kies.

FUR L. Lowland. In outhouses.
DISTRIBUTION—EAST. ♀ Forth ♀ Dee ♀ o o o
WEST. Solway ♀ o o o

LICHENUM Marsh. Very rare.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

"Raehills." Murray Cat.

NIPTUS Kies.

HOLOLEUCUS Fald. In old houses and warehouses.
DISTRIBUTION—EAST. ♀ Forth Tay ♀ Moray o o o
WEST. Solway ♀ o o o

CRENATUS Fab. In old houses.
DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o
WEST. Solway ♀ o o o

GIBBIUM Kies.

SCOTIAS Fab. Not indigenous.
DISTRIBUTION—"Arlary in Kinross-shire, among dried plants from India." Murray Cat.

MEZIUM Kies.

SULCATUM Fab. Not indigenous.
DISTRIBUTION—"Edinburgh, among a consignment of Decapods from Australia." Murray Cat.

PRIOBIUM Kies.

CASTANEUM Fab. Rare. On trunks of trees.
DISTRIBUTION—EAST. Tweed Forth Tay ♀ Moray o o o
WEST. ♀ ♀ o o o

ANOBIUM Kies.

DOMESTICUM Four. Common in furniture and wood in houses.
DISTRIBUTION—EAST. ♀ Forth Tay Dee Moray o o o
WEST. Solway ♀ o o o

PANICEUM L. Rare. In stores: probably only occasionally introduced.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

XESTOBIUM Kies.

TESSELATUM F. Very rare.
DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway o o o o

"Raehills." Rev. W. Little.

ERNOBIUS Kies.

NIGRINUS Sturm. Highland. On Scots fir.
DISTRIBUTION—EAST. o o Tay Dee Moray o o o
WEST. o o o o o

MOLLIS L. Local. In palings and under bark.
DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. o o o o o

OCHINA Kies.

HEDERÆ Muller. Very rare.
DISTRIBUTION—EAST. o o o Dee o o o o
WEST. o o o o o

Found near Arbroath by Mr Hislop.

PTILINUS Kies.

PECTINICORNIS L. Very rare. In old trees.
DISTRIBUTION—EAST. ♀ Forth o o o o o o
WEST. Solway o o o o

CISSIDÆ.

CIS Lat.

BOLETI Scop. Highland and Lowland. Abundant in *Polypori.*
DISTRIBUTION—EAST. Tweed Forth Tay Dee ♀ o o o
WEST. Solway ♀ o o o

BIDENTATUS Ol. Local. In *Polypori.*
DISTRIBUTION—EAST. ♀ ♀ Tay ♀ Moray o o o
WEST. ♀ Clyde o o o

FESTIVUS Panz. Not common. In *Polypori.*
DISTRIBUTION—EAST. Tweed ♀ Tay Dee o o o o
WEST. ♀ ♀ o o o

ALNI Gyll. Very rare.
DISTRIBUTION—EAST. o o o Dee o o o o
WEST. o o o o o

PUNCTULATUS Gyll. Rare. In *Polyporus abietinus* on Scots fir.
DISTRIBUTION—EAST. o Forth Tay Dee Moray o o o
WEST. o o o o o

LINEATOCRIBRATUS Mell. Local. In *Polyporus nigrinus* on birch.
DISTRIBUTION—EAST. o o Tay ♀ Moray o o o
WEST. o o o o o

NITIDUS Hbst. In *Polypori.*
DISTRIBUTION—EAST. ♀ ♀ Tay o o o o o
WEST. ♀ ♀ o o o

JACQUEMARTI Mell. In *Polypori.*
DISTRIBUTION—EAST. ♀ ♀ Tay Dee ♀ o o o
WEST. ♀ ♀ o o o

(*To be continued.*)

ZOOLOGY.

THE BIRDS OF THE SOUTH-EAST OF SCOTLAND.

By D'ARCY W. THOMPSON.

(*Continued from page* 282.)

INSESSORES. DENTIROSTRES.

MERULIDÆ.

26. CINCLUS AQUATICUS. *Bech.* The Common Dipper.
Common. To be seen by every stream in all the upland districts. Dr Turnbull states, and is corroborated by Mr Gray, that it frequents the sea-shore near Dunbar.

27. TURDUS VISCIVORUS. *Linn.* The Missel Thrush.
Very common. This bird seems to have greatly increased in numbers of late years.

28. TURDUS PILARIS. *Linn.* The Field-fare.
Common during winter-time.

29. TURDUS MUSICUS. *Linn.* The Song-thrush, *or* Mavis.
Common everywhere.

30. TURDUS ILIACUS. *Linn.* The Redwing.
Abundant in winter and early spring. Arrives rather earlier, as a rule, than the Field-fare.

31. TURDUS MERULA. *Linn.* The Blackbird.
Exceedingly common.

32. TURDUS TORQUATUS. *Linn.* The Ring Ouzel.
Not uncommon on the Pentlands and Lammermoors, where it breeds.

33. ORIOLUS GALBULA. *Linn.* The Golden Oriole.
A rare visitor from the south. Restalrig, 1807;[1] Kirkcaldy, 1870;[2] Kirkconnel, 1872;[3] near Edinburgh, 1876.

SYLVIIDÆ.

34. ACCENTOR MODULARIS. *Linn.* The Hedge Sparrow.
Very common.

35. ERYTHACA RUBECULA. *Linn.* The Robin Red-breast.
Very common.

[PHŒNICURA SUECICA. *Selby.* The Blue-throated Warbler.
This bird has probably never been obtained precisely within our limits. One was shot at Aberdeen, in May 1876. A nest in Dumfriesshire, 1858.[2]]

36. PHŒNICURA RUTICILLA. *Gould.* The Redstart.
Rather sparingly distributed, but by no means rare. Probably increasing in numbers.

37. PHŒNICURA TITHYS. *Selby.* The Black Redstart.
A straggler. Kincardineshire, Nov. 1876 (Mr Harvie Brown); Elie, Aug. 1876 (Gray in Proc. of Berw. Nat. Club).

38. SAXICOLA RUBICOLA. *Flem.* The Stonechat.
Tolerably abundant.

39. SAXICOLA RUBETRA. *Flem.* The Whinchat.
If anything, rather more numerous than the Stonechat.

40. SAXICOLA ŒNANTHE. *Linn.* The Wheatear.
Common during spring and summer.

41. SALICARIA LOCUSTELLA. *Selby.* The Grasshopper Warbler.
A rare summer migrant. Mr James Hardy says that it was formerly much more numerous in Berwickshire than now.[4] One was shot close to Edinburgh in May 1878. (Breeds rather abundantly in Durham.)

[1] Turnbull's 'Birds of East Lothian.'
[2] Gray's Birds of the West of Scotland.' [3] 'Scottish Naturalist.'
[4] Proc. of Berw. Nat. Field Club.

42. SALICARIA PHRAGMITIS. *Selby.* The Sedge Warbler.
Not very abundant; much rarer than on the west coast.

43. SALICARIA ARUNDINACEA. *Selby.* The Reed Warbler.
Of doubtful occurrence in our neighbourhood. Bathgate (Gray). Sometimes seen in East Lothian (Turnbull).

44. PHILOMELA LUCINIA. *Selby.* The Nightingale.
Reported on very doubtful authority only. Said to have been heard in Linlithgowshire in 1826, and in Dalmeny Woods in 1839.

45. CURRUCA ATRICAPILLA. *Flem.* The Blackcap.
Not common. Breeds in East Lothian and Berwickshire, and also, but rarely, near Edinburgh. Probably most abundant in Berwickshire.

46. CURRUCA HORTENSIS. *Flem.* The Garden Warbler.
Not rare, but nowhere very numerous.

47. CURRUCA CINEREA. *Selby.* The Whitethroat.
Common.

48. CURRUCA SYLVIELLA. *Flem.* The Lesser Whitethroat.
Very scarce indeed.

49. SYLVIA SYLVICOLA. *Penn.* The Wood Warbler.
Not very common. Plentiful in a few localities—*e. g.*, near Lauder, Tynninghame, &c. &c.

50. SYLVIA TROCHILUS. *Penn.* The Willow Wren.
Common.

51. SYLVIA RUFA. *Temm.* The Chiff-chaff.
Rare, but probably often confounded with the last species.

52. REGULUS CRISTATUS. *Koch.* The Golden-crested Wren.
Abundant. Common very close to Edinburgh.

53. REGULUS IGNICAPILLUS. *Jenyns.* The Fire-crested Wren.
Very seldom identified, but probably not extremely rare. Gladsmuir, 1848;[1] also at Whittingham.

[1] Turnbull's 'Birds of East Lothian.'

PARIDÆ.

54. PARUS MAJOR. *Linn.* The Great Tit.
Common.

55. PARUS CÆRULEUS. *Linn.* The Blue Tit.
Very abundant.

56. PARUS CRISTATUS. *Linn.* The Crested Tit.
A rare straggler. Near Edinburgh, 1858 (Saxby). Has been taken more frequently on the west coast than here. It is a northern species.

57. PARUS ATER. *Linn.* The Cole Tit.
Common in all the woods and plantations.

58. PARUS PALUSTRIS. *Linn.* The Marsh Tit.
Very scarce. Not uncommon in Roxburghshire (Dr Jerdon).

59. PARUS CAUDATUS. *Linn.* The Long-tailed Tit.
Rather plentiful in many places.

AMPELIDÆ.

60. AMPELIS GARRULUS. *Linn.* The Bohemian Waxwing.
A rather frequent winter visitor; one or two being secured about every year along the coast. A flock of eleven were seen a few years ago at Gullane.

MOTACILLIDÆ.

61. MOTACILLA YARRELLII. *Gould.* The Pied Wagtail.
Common.

62. MOTACILLA ALBA. *Linn.* The White Wagtail.
Very rare. Dunbar, 1847.[1] Two at Burntisland, Oct. 1875.[2]

63. MOTACILLA BOARULA. *Penn.* The Grey Wagtail.
Common, but not so abundant as the Pied Wagtail. Said to be scarce in Berwickshire.

[1] Turnbull's 'Birds of East Lothian.'
[2] Gray's 'Birds of the West of Scotland.'

64. MOTACILLA NEGLECTA. *Gould.* The Grey-headed Wagtail.
A very rare visitor. Near Edinburgh, 1804.[1] Two in 1835.[2] Dunbar, 1868.[1]

65. MOTACILLA RAYI. *Bonap.* Ray's Wagtail.
Rare; frequently confounded with the Grey Wagtail. Very much more numerous in the West of Scotland.

ANTHIDÆ.

66. ANTHUS ARBOREUS. *Bechst.* The Tree Pipit.
Not common.

67. ANTHUS PRATENSIS. *Linn.* The Meadow Pipit.
Common.

68. ANTHUS PETROSUS. *Flem.* The Rock Pipit.
Tolerably abundant on the shore throughout the year. Cramond Island and Inch Mickery seem favourite haunts.

69. ANTHUS LUDOVICIANUS. *Gmelin.* The Pennsylvanian Pipit.
A most interesting bird, first added to the British list from specimens obtained in our neighbourhood. Two near Edinburgh in 1824 (Macgillivray). Several at Dunbar about 1845,[1] and once or twice subsequently.

CONIROSTRES.

ALAUDIDÆ.

70. ALAUDA ALPESTRIS. *Linn.* The Shore Lark.
A very rare bird, which seems to have occurred with exceptional frequency near Tynninghame—viz., 1859,[1] 1861,[2] and 1869.[1] Several at St Andrews, 1865.[2]

71. ALAUDA ARVENSIS. *Linn.* The Sky Lark.
Common.

72. ALAUDA ARBOREA. *Linn.* The Wood Lark.
Very rare indeed.

[1] Gray's 'Birds of the West of Scotland.'
[2] Turnbull's 'Birds of East Lothian.'

EMBERIZIDÆ.

73. PLECTROPHANES NIVALIS. *Linn.* The Snow Bunting.
Plentiful near the shore in cold weather; often occurring in very large flocks.

74. EMBERIZA MILIARIA. *Linn.* The Corn Bunting.
Rare. Occasionally caught by the Edinburgh bird-catchers. Breeds near St Andrews, and in Dumfriesshire.

75. EMBERIZA SCHŒNICLUS. *Linn.* The Black-headed Bunting.
Rather abundant.

76. EMBERIZA CITRINELLA. *Linn.* The Yellow-hammer.
Common.

77. EMBERIZA CIRLUS. *Linn.* The Cirl Bunting.
An irregular visitant. Near Edinburgh, 1816,[1] 1837.[2] Yetholm, 1840.[1] Once in East Lothian.[2]

[EMBERIZA HORTULANA. *Linn.* The Ortolan.
Of very doubtful occurrence. One was taken at Aberdeen in 1863, but was probably an escape.]

[EMBERIZA CIRIS. The Painted Bunting.
Banff: Thomas Edward.]

FRINGILLIDÆ.

78. FRINGILLA CŒLEBS. *Linn.* The Chaffinch.
Very common.

79. FRINGILLA MONTIFRINGILLA. *Linn.* The Brambling Finch.
Common in the winter. Very large flocks visit the neighbourhood of Edinburgh.

[ZONOTRICHIA ALBICOLLIS. *Gmelin.* The White-throated Sparrow.
An American bird. Aberdeen, 1867.[1]]

80. PASSER MONTANUS. *Linn.* The Tree Sparrow.
Singularly local in our district. Common near North Berwick, and at several other places in Haddingtonshire.

[1] Gray's 'Birds of the West of Scotland.'
[2] Turnbull's 'Birds of East Lothian.'

81. Passer domesticus. *Linn.* The House Sparrow.
Common everywhere.

82. Coccothraustes chloris. *Linn.* The Green Linnet.
Very common.

83. Coccothraustes vulgaris. *Briss.* The Hawfinch.
Very rare indeed. Said to be occasionally seen in Haddingtonshire.[1] One or two in Dumfriesshire (Sir W. Jardine). Perth, 1860.

84. Carduelis elegans. *Selby.* The Goldfinch.
This bird has now become exceedingly rare with us; indeed it is almost extinct near Edinburgh. There was a nest at Roslin in 1876. Probably rather less rare in Berwickshire.

85. Carduelis spinus. *Selby.* The Siskin.
Rather abundant in winter-time. Has bred near Haddington and in Fifeshire.[1] I have seen many pairs in the breeding-season near Comrie, Perthshire, where they probably breed rather plentifully.

86. Linota cannabina. *Linn.* The Common Linnet.
Abundant.

87. Linota canescens. *Bonap.* The Mealy Redpoll.
Rare, but probably commoner than supposed. I possess a fine caged specimen, caught near Edinburgh. Very numerous in 1854-5.

88. Linota linaria. *Yarrell.* The Lesser Redpoll.
Common during winter-time. Mr Scot Skirving believes that a pair bred near Edinburgh this season.

89. Linota montium. *Yarrell.* The Twite, *or* Heather Lintie.
Very scarce. I have only seen one caught by the Edinburgh bird-catchers during several years. Numerous in Berwickshire, 1874[2].

[1] Gray's 'Birds of the West of Scotland.'
[2] Proc. of Berw. Nat. Field Club.

LIBRARY

90. Pyrrhula vulgaris. *Flem.* The Bullfinch.
Nowhere common. Probably most numerous in Haddingtonshire and Linlithgowshire.

[Pyrrhula enucleator. *Linn.* The Pine Grosbeak.
A very rare straggler from the north. Edinburgh, 1808.]

91. Loxia curvirostra. *Linn.* The Common Crossbill.
Rare. Seen now and then in small flocks. One of 40 or 50 occurred in Berwickshire in 1870. I have reason to believe the Crossbill breeds in Linlithgowshire.

[Loxia bifasciata. *Wilson.* The European White-winged Crossbill.
A rare straggler. Roxburgh, 1845 (Yarrell).]

[Loxia leucoptera. *Gmeln.* The American White-winged Crossbill.
Of equally rare and exceptional occurrence. Jedburgh, 1841.[1]]

(*To be continued.*)

Birds of the South-east of Scotland.—I should like to see the above list made as full and accurate as possible, especially as, so far as I am aware, there is no complete list for the district, but a large amount of material scattered through various publications. I was disappointed at the very outset, when looking over it, to find several inaccuracies. There were also some doubtful cases inserted—birds seen only from a distance; while others, which had been actually captured and recorded in the same work, were omitted. Most of the records of rare species will doubtless be correct, but the following, concerning the Golden Eagle, I believe are incorrect: "Roxburgh, 1876, and Jan. 1877 ('Berw. Nat. Proc.,' vol viii. p. 196); Dunse, Jan. 1877" (see 'Scot. Nat.,' July 1878, p. 278). The only Golden Eagle that I am aware of having been obtained in the above district about that time was a young female, which was shot on the Cheviots by one of the Duke of Roxburghe's gamekeepers on the 13*th of February* 1877. The eagle shot at Marchmont (Dunse), *February* 7, 1877, and which went the round of the newspapers as a Golden Eagle, was an Erne! as also another which was captured a few years ago on the neighbouring estate of Chesters.

Under "the Osprey," after mentioning a few instances, we find "several old or unauthenticated instances are mentioned in the 'Proc. of the Berw. Nat. Club,' and elsewhere." Besides several old specimens that I have seen which

[1] Gray's 'Birds of the West of Scotland.'

were shot on the Tweed in this neighbourhood, I may mention an additional recent example,—a female which was shot on Sept. 25, 1876, by Mr J. Kerss, on the Tweed, about two miles below Kelso, and which is now in Mr A. Steel's collection ('Proc. Berw. Nat. Club,' viii. 182). This seems to be considered one of the "unauthenticated instances," as it was recorded in the same publication which is quoted, but inaccurately, for the incorrect records of the Golden Eagle.

Under "Goshawk" we have "Berwickshire, Jan. 1876," and under "Marsh Harrier," "Tweedside, Oct. 1875." Are these not also errors? If not, I should be obliged for the localities.—ANDW. BROTHERSTON, Kelso.

Notice of the Wryneck (Yunx torquilla) being found in Perthshire.—Mr Thomas Marshall, of Stanley, in a letter to me, mentions the capture of the Wryneck at Stanley on the 6th inst. The bird was brought to him by a lad, who found it on the bank of the Caledonian Railway. It was alive at the time, but could not fly, being apparently injured by a shot-wound, there being a small hole in the back. Having long been of opinion that the Wryneck was an inhabitant of the woods on the banks of the Tay, about Ballathy, not very far from Stanley, its capture there is to me highly interesting; for while fishing in that neighbourhood some years ago, and for several seasons in succession, I repeatedly, in the spring months, heard its unmistakable *tee, tee, tee*, in more directions than one, proceeding from the boles of some of the old standard oak-trees in the recently-cut coppice-woods near the banks of the river; but not having had the good fortune of catching a sight of the bird, I never felt justified in giving it a place in the list of our summer visitants, notwithstanding that the call-note was so well known to me, that I could hardly be mistaken in its identity. Now, however, I think it may safely be included in the fauna of Perthshire as a regular, though perhaps only a local, visitant to the county. If memory serves me right, I have heard the same call-note in the Fascally woods in Athole,—a note so well known to the country people in Middlesex and other southern counties of England, that the bird, which is there common, goes by the name of Cuckoo's-mate, being considered like that bird a harbinger of summer, and is accordingly everywhere welcomed. The Wryneck, though common in the southern counties, like the Nightingale, seems partial in its visits, restricting itself more particularly to the eastern counties, rarely ever being seen in Cornwall and the west, and never in Ireland. It is rare in the north, and perhaps Perthshire may be considered its extreme breeding limits. It has been once or twice noticed in Orkney and Shetland; but these may only be taken as casual cases, probably Continental birds driven out of their line of passage.—H. M. DRUMMOND HAY, Seggieden, *Sept.* 12, 1878.

THE LEPIDOPTERA OF MONCREIFFE HILL.

BY SIR THOMAS MONCREIFFE, BART.

(*Continued from page* 297.)

Cartella bilunana.—Rare. I have only one specimen taken here, which is curious, as there is plenty of birch.

Hedya paykulliana.—Common among birch in July and August.

H. lariciana.—We take this tortrix in July, at an elevation of 500 feet and upwards, among larch, where it appears to be fairly common, though not easy to obtain, as it flies late and pretty high.

H. trimaculana.—Common. Beaten out of Scotch elm in July and August. Varies a good deal in shade of colour and markings.

Steganoptycha nævana.—Abundant in July and August among apple and nut trees in my orchard. The orchard is bounded by holly hedges.

S. geminana.—Frequent among *Vaccinium* (bilberry) in July and August, at 550 feet of an elevation.

Anchylopera mitterbacheriana.—Not common. Occurs among oak and thorn trees in June. Apparently varies very little.

A. myrtillana.—Common among *Vaccinium* at an elevation of 500 feet and upwards, and varies in the shape of the dorsal blotch. Some specimens approach very closely to *lundana*, whilst in others the upper angle of the dorsal blotch has a round hump, which is in some cases divided into a separate spot.

A. lundana.—Not common. Have taken a few specimens among rough herbage at a low elevation in July.

A. unguicella.—Very local, but always to be met with on a bare rocky face in May. Varies much in size and brilliancy of markings.

Bactra lanceolana.—Abundant in certain localities. Varies considerably in size. Flies in June.

Argyrotoza conwayana.—A common and variable insect, both in size, shade of colour, and intensity of markings. Among ash-trees in May and June.

Dictyopteryx contaminana.—Beaten commonly out of oak in May and August. Some specimens nearly black.

D. læfflingiana.—Also common in July among oak, varying much in intensity of shade.

D. bergmanniana.—Plentiful amongst rose-bushes in July.

Cheimatophila mixtana.—Frequent among heather, at an elevation of 550 feet, in the month of October.

Oxygrapha literana.—A fairly common insect; more so after hibernation in the perfect state. Three out of four of Wood's varieties occur. His *tricolorana* probably loses the reddish tinge, as I have seen an approach to it, although the red seemed to have faded away. *O. scotana* occurs in the immediate neighbourhood, but scarcely within the prescribed limit of the boundary to which I confine myself. July to March.

O. scabrana.—I have one specimen in my cabinet, as taken here, but I have no note of the whereabouts.

Peronea schalleriana.—Common in certain localities. Several beautiful varieties occur; among others, var. *latifasciana* of Haworth, in August. I take it in company with *comparana*, lodging among *Spiræa ulmaria*, and also among the apple-trees in my orchard. It appears to me to be rather difficult to separate the dark varieties of this insect and the following:—

P. comparana, which I take also by beating in the thorn hedgerows where no willow grows. In numbers in August and September.

P. favillaceana (*sponsana*).—Also a common insect in my shrubbery, but I cannot find out that it is particularly attached to beech, as it appears to occur more in the immediate neighbourhood of sallow. August and September.

P. variegana.—Plentiful on the apricot-trees. Several varieties occur. August and September.

P. aspersana. — Not so common as some of the genus. Varies excessively in size. Flies in August.

P. ferrugana.—Common everywhere.

P. caledoniana.—Locally common among heather and *Vaccinium*, at an altitude of 500 feet and upwards. In August and July.

Teras caudana.—Common, in August and September, on poplar and willow. All Wood's varieties occur, and a darker variety also, which he does not depict.

Pœcilochroma corticana.—Common and variable. Some varieties both small and dark. July and August.

P. ratzburghiana.—Frequent amongst spruce fir in July.

Roxana arcuana. Rare, which is curious, as ferns abound. I have taken it flying in beech-woods in May and June.

BIOLOGICAL

Semasia wœberiana.—Locally frequent on apple-trees in my garden in June.

S. nanana.—Not very common, and local. July.

Ephippiphora regiana.—Frequent on the bark of sycamore-trees in June. Between 9 and 10 A.M. is the best time to look for them.

E. argyrana.—Common in June. To be found on the trunks of oak-trees, or beaten off the branches.

Stigmonota compositella.—Flies freely in June of an afternoon among the natural hay in front of my house.

S. perlepidana.—Frequent, but local. Attached to *Lathyrus pratensis*, the meadow vetchling, among which it may be found in the end of May and in June.

Asthenia coniferana.—Abundant on the trunks of old Scots fir in August, at an altitude of 500 feet.

A. strobilella.—Easily reared from spruce-fir cones, if gathered when fallen and thrown into a box. The perfect insect appears in March.

A. splendidulana.—Not uncommon on Moncreiffe Hill. Have beat it off oak in May, and taken it at rest on pine-trunks in June.

Retinia pinivorana.—Rare, or is probably more or less confined to the tops of the pine-trees. I have one specimen, taken at rest on a Scots fir trunk in July 1874.

R. occultana.—Plentiful in August among larch, at all altitudes, especially about 500 feet.

Pamplusia monticolana.—Frequent among heather in August. To be taken flying over the plants or at rest on the foliage.

Heusemine fimbriana.—Not uncommon, but local, and difficult to capture. I have taken it at all altitudes, beaten off oak in April. I have also a specimen taken by lamplight from sallow-blossom when shaken over a sheet for *Tæniocampæ*.

Endopisa saturnana.—This is one of those insects which is rather puzzling to determine. I have one or two specimens (named by Mr Barrett), which I have taken here, some, at an altitude of 500 feet, among wood-sage, others among rough herbage by the river-side. They fly in the daytime in the month of May.

E. nebritana (*pisana*).—Common among rough herbage and natural hay in July. This is not the *nigricana* of Herrich Schæffer, which is found only in Germany and Greece. *Nebritana* Treitschke is the prior name, according to Staudinger.

Grapholita succedana (*ulicetana*). — Abundant among furze-bushes. Varies in size and shade of colour.

Sciaphila subjectana. — Abundant some seasons, but not as regularly as *virgaureana*, which is a perfect pest, and feeds on everything. I have reared it from the flowers of valerian and the leaves of the primrose, and many other trees and plants.

S. octomaculana.—Common but local. Comes to sugar at night freely, and may be disturbed from rough herbage in the daytime, at the end of July and in August. Differs much in the intensity of the markings, the female being usually, I think, the darker of the sexes.

S. penziana.—Local, though frequent, but not to be called common. We take it sitting on the rock faces, from midsummer onwards for some weeks, where the bell-heather and wood-sage grow.

Ablabia pratana.—A perfect pest in some localities, principally at the higher altitudes.

Euchromia ericetana.—Abundant in 1876 in a bean-field near the river; and Mr Herd took it at a slightly higher altitude in a grass-field the same season. He tells me he has taken it this season (1878). I have not had time to look for it. Flies in July and August.

Orthotænia antiquana.—Not common, at least I have taken very few specimens.

Sericoris lacunana.—Plentiful everywhere through the summer up to October.

S. urticana.—More local than the last species, but occurs plentifully on Moncreiffe Hill at an altitude of 500 and 600 feet. It certainly cannot feed on nettles, raspberry, or *Epilobium* here, which I see Wilkinson gives as the principal food-plants. It is most plentiful among the wood-sage.

S. micana.—Mr Herd tells me he has specimens taken here; but I think there must be some mistake, as I have never been able to find it.

S. cespitana.—Abundant, and most variable both in size and shades of colour. Some specimens are large and greenish, others small and reddish or rust colour. We take it in the garden among the rose-bushes, and up to 600 feet among wood-sage and heather, the former of which appears to be a great favourite. The different forms have puzzled Dr White and me much. It flies all through the summer; the smaller form is most plentiful in August.

Mixodia schulziana. — Common but local. June and July among heather and *Vaccinium* at the higher altitudes.

M. palustrana.—Frequent, but local in the same ground where *schulziana* is found. I see Wilkinson says among fir-trees, but it it is not necessarily so here; I should say more among bell-heather.

Argyrolepia badiana.—Local and not very common. May be easily overlooked, however, as it appears to fly late, and is not long on the wing, resting through the daytime among the bur-docks and dropping among the herbage when disturbed. I have only taken it from the 12th to the 29th of July.

Eupœcilia atricapitana.—I have only seen half-a-dozen of this species since 1870 till this year, when Dr White and I took about twenty specimens among wood-sage on a stony face of a few yards square, on Moncreiffe Hill, on the 14th, 15th, and 16th of August. We found it always resting on the leaves of the wood-sage. Lord Walsingham tells me that he takes it on the flowers of the ragweed at Merton. Here I have never seen it on that plant, but always on or among wood-sage, and in stony places. Curiously enough, I see that Herrich Schæffer mentions one of the genus, *posterana*, as being partial to stone quarries. Some of my specimens are of a beautiful rose-colour.

E. nana.—Not common. I have one or two specimens taken in different localities; but I have not hit upon its headquarters.

E. augustana.—Frequent, but not common. I have always seen this insect most plentiful on the heather hills. It swarms in Glen Tilt.

Cochylis straminea.—Extremely local. I know of one place only where it occurs here; but there it is, I may say, plentiful in July, on a rough bank of mixed herbage and wild flowers. May be disturbed in the daytime, and flies in the evening.

Xanthosetia hamana.—Occurs commonly at the same time and in the same place as *C. straminea.* Several varieties occur, some pale straw-colour without markings; others with ferruginous markings, variable in number and position.

X. zœgana.—In the same place and about the same time as the former. Does not vary.

Tortricodes tortricella.—Plentiful in the woods in early spring. Varies considerably in intensity of shade.

Addenda.

Hypermecia augustana.—Mr Herd has, I find, taken this tortrix on Moncreiffe Hill, so it must be added to the list.

Halonota turbidana.—Mr Herd has also two specimens taken at Moncreiffe, near the river-side.

Coccyx distinctana.—I have taken what I believe to be this tortrix on silver fir and *Pinus nordmanniana*. Lord Walsingham was kind enough to send me some specimens to compare, which he had taken on *Pinus cephalonica* at Merton, and as mine are identical with his, and with Herrich Schæffer's figure of *proximana*, which Staudinger makes the same insect as our *distinctana*, I have no doubt I am correct in giving it a place in this list.

Tortricina.

327. Sarrothripa revayana.
328. Amphysa gerningana.
329. Hypermecia augustana.
330. Eulia ministrana.
331. Penthina corticana.
332. „ betuletana.
333. „ prælongana.
334. „ cynosbatella.
335. Clepsis rusticana.
336. Tortrix viridana.
337. „ heparana.
338. „ ribeana.
339. „ corylana.
340. Lozotænia musculana.
341. „ xylosteana.
342. „ rosana.
343. Batodes angustiorana.
344. Ptycholoma lecheana.
345. Pardia tripunctana.
346. Spilonota trimaculana.
347. Lithographia campoliliana.
348. „ cinerana.
349. „ nisella.
350. „ penkleriana.
351. Phlæodes tetraquetana.
352. Pædisca sordidana.
353. „ solandriana.
354. Pædisca ophthalmicana.
355. Catoptria cana.
356. „ scopoliana.
357. Halonota bimaculana.
358. „ trigeminana.
359. „ cirsiana.
360. „ scutulana.
361. „ brunnichiana.
362. „ tetragonana.
363. „ turbidana.
364. Dicrorampha petiverella.
365. „ alpinana.
366. „ plumbagana.
367. „ plumbana.
368. „ herbosana.
369. „ consortana.
370. Coccyx distinctana.
371. „ hyrciniana.
372. Capua ochraceana.
373. Cartella bilunana.
374. Hedya paykulliana.
375. „ lariciana.
376. „ trimaculana.
377. Steganoptycha nævana.
378. „ geminana.
379. Anchylopera mitterbacheriana.

380. Anchylopera myrtillana.
381. „ lundana.
382. „ unguicella.
383. Bactra lanceolana.
384. Argyrotoza conwayana.
385. Dictyopteryx contaminana.
386. „ lœfflingiana.
387. „ bergmanniana.
388. Oxygrapha literana.
389. „ niveana.
390. „ scabrana.
391. Peronea schalleriana.
392. „ comparana.
393. „ mixtana.
394. „ favillaceana.
395. „ variegana.
396. „ aspersana.
397. „ ferrugana.
398. „ caledoniana.
399. Teras caudana.
400. Pœcilochroma corticana.
401. „ ratzburghiana.
402. Olindia ulmana.
403. Roxana arcuana.
404. Semasia wœberiana.
405. „ nanana.
406. Ephippiphora regiana.
407. „ argyrana.
408. Stigmonota composana.
409. „ perlepidana.
410. Asthenia coniferana.
411. „ strobilella.
412. „ splendidulana.
413. Retinia pinivorana.
414. „ occultana.
415. Pamplusia monticolana.
416. Heusemine fimbriana.
417. Endopisa saturnana.
418. „ nebritana.
419. Grapholita succedana.
420. Sciaphila subjectana.
421. „ virgaureana.
422. „ octomaculana.
423. „ penziana.
424. Ablabia pratana.
425. Euchromia ericetana.
426. Orthotænia antiquana.
427. Sericoris lacunana.
428. „ urticana.
429. „ cespitana.
430. Mixodia schulziana.
431. „ palustrana.
432. Argyrolepia badiana.
433. Eupœcilia atricapitana.
434. „ nana.
435. „ angustana.
436. Cochylis straminea.
437. Xanthosetia hamana.
438. „ zœgana.
439. Tortricodes hyemana.

Vanessa antiopa in Fife.—On August 18th, I was hunting about in one of the fields close to the house at Balmuto when my attention was drawn to a large butterfly which was "sailing about" at some distance, and on going towards it I saw a fine specimen of *Vanessa antiopa* sitting upon a head of ragwort flower. I had nothing with me but a heavy sweeping net; but on my approach it did not give me time to use it, but sailed over my head to the opposite side of the field. Two or three times I thought I should get within reach, but it never settled down, and at last flew over a long belt of wood and vanished. I followed round to a flowery field where I thought it might stop, but could see no more of it. Dr Boswell came out with me afterwards, and we explored the neighbourhood well, but it never put in another appearance. We have searched for more but without success.—JOHN A. POWER, Balmuto, by Kirkcaldy, *Sept.* 4, 1878.

Vanessa antiopa on Ben Lawers.—I had the good fortune to capture *Vanessa antiopa* on the west side of Ben Lawers, on the 26th of August. The altitude was, I think, between 1500 and 1600 feet.—A. CRAIG CHRISTIE, Millmore, Killin, *August* 29, 1878.

Capture of Pachnobia hyperborea.—When collecting on a mountain near Glen Tilt last July, I had the pleasure of putting my net over a specimen of *Pachnobia hyperborea* which Mr W. Herd saw flying in the daytime over some rough stony ground. This species has not, I think, been taken in Athole since Mr Douglas discovered it (as a British species) on Ben Ghlo many years ago. A good many specimens have, I understand, been taken in Rannoch this year.—F. BUCHANAN WHITE.

Capture of Coccyx distinctana.—On the 27th of June 1877, I took a tortrix from silver fir in my shrubbery which struck me as differing from *C. hyrciniana*. On the 14th of June of this year, I took several specimens of the same tortrix on *Pinus nordmanniana*. As it appeared to me to answer the description of *C. distinctana* of Wilkinson and Stainton, and the *Pædisca* (?) *proximana* of Staudinger and Herrich Schæffer, I communicated with Mr Hodgkinson of Preston and Lord Walsingham, who were both said to have taken *C. distinctana*. They both kindly forwarded me specimens for comparison, and I find that my insect is identical with that taken by Lord Walsingham at Merton. Mr Hodgkinson's insect is the same as our *hyrciniana;* and I think he must have made some mistake in the types he sent to me, as they do not agree with the description which he himself gives me of the original *distinctana* as captured by him and described by Wilkinson, who says, "It is easily separated from *hyrciniana*, 1st, by the anterior wing being less streaky; 2d, by the streaks themselves being more defined; 3d, by the first two costal streaks beyond the middle uniting, and being produced uninterruptedly to the anal angle." I am doubtful as to the absence of the white spot on the ciliæ being a distinctive character as held by Doubleday, as in Herrich Schæffer's figure it is distinctly visible; and in my specimens, as well as in Lord Walsingham's, some are without it, though some have it, though not so markedly as in *hyrciniana*. Lord Walsingham tells me he takes it on *Pinus cephalonica*, and that Dr Wood has bred it from silver fir.—THOS. MONCREIFFE, Moncreiffe House, *August* 13, 1878.

Curious habit of Chrysocoris festaliella.—I noticed a curious habit in a specimen of this insect that I captured near Birnam this year, which Mr Stainton tells me has not been hitherto observed. It reminded me very much of a sculler in his skiff, hoisting its hindmost legs very much as the above-mentioned individual would rest his oars in the rowlocks when desisting from his labours. Making occasionally, as Mr Stainton aptly observes, "a demi-pirouette," by dropping one leg, and propelling itself to left or right as the case might be; then dropping both legs at once, as a sculler might dip his oars in the water when he wished to make a forward movement. Not knowing the habits of the insect, and as I captured it by a pond-side, I almost wondered whether it was semi-aquatic, and occasionally disported itself on the surface, or on the floating leaves of "potamogeton," or other plants which lie on the surface of the water. So much for imagination, as I am told the larva mines the leaves of raspberry plants.—THOS. MONCREIFFE, Moncreiffe House, *Aug.* 1878.

PHYTOLOGY.

SUPPLEMENTARY* LIST OF FUNGI FOUND WITHIN THE PROVINCE OF MORAY.

By the Rev. JAMES KEITH, A.M.

AGARICUS, L.

LEPIOTA.

703. Clypeolarius, Bull. Altyre. Oct.
704. Cepæstipes, Sow. Var. A. on wood in stove at Dalvey.
Var. B. on leaf-bed in stove at Gordon Castle. J. Webster.
705. Sistratus, Fr. Forres. B. & Br. Ann. Nat. Hist., No. 1185.

TRICHOLOMA.

706. Ustalis, Fr. Altyre woods, &c. Sept.-Oct.
707. Acerbus, Bull. Sanquhar. Sept. Rare.

CLITOCYBE.

708. Opacus, With. Altyre woods. Oct.

PLEUROTUS.

709. Tremulus, Schæff. On moss. Aviemore. Sept.
710. Applicatus, Batsch. Greeshop wood. May and Oct.

COLLYBIA.

711. Esculentus, Jacq. Pastures. Aviemore.
712. Inolens, Weinm. Cothall. Nov.

MYCENA.

713. Peltatus, Fr. Altyre woods. Aug.-Sept.
714. Vitreus, Fr. Altyre woods and Kinrara. Sept.
715. Hiemalis, Osbeck. On oak-trees, Whiterow. Sept.

OMPHALIA.

716. Pyxidatus, Bull. Aviemore. Sept.
717. Griseus, Fr. Aviemore. Sept.

VOLVARIA.

718. Gloiocephalus, Fr. Manse garden. Forres. June.

* The first list will be found in Scot. Nat., vol. ii.

ENTOLOMA.

719. Prunuloides, Fr. Alvie and Rothiemurchus. Aug.
720. Bloxami, B. and Br. Rothiemurchus. Sept. Rare.
721. Griseo-cyaneus, Fr. Alvie and Kinrara. Aug.-Sept.

LEPTONIA.

722. Asprellus, Fr. Pastures. Alvie. Aug. Frequent.

NOLANEA.

723. Rufo-carneus, B. and Br. Heaths. Aviemore. Aug.-Sept. Frequent.

PHOLIOTA.

724. Caperatus, Fr. Birch-wood, above Grantown. 4th Aug. Rare.
725. Erebius, Fr. Altyre wood, beyond Manachie. Sept.
726. Togularis, Bull. Rafford. May.

HEBELOMA.

727. Versipellis, Fr. Rothiemurchus. Kinrara. Aug. Rather rare. Verified by Berkeley.
728. Euthelus, B. and Br. Forres House grounds and Sanquhar. Sept.
729. Hiulcus, Fr. Cluny Hill. Sept.

CREPIDOTUS.

730. Rubi, Berk. On a beech stick. Banks of Findhorn, opposite Cothall. 26th Aug. 1874.

NAUCORIA.

731. Erinaceus, Fr. Repeatedly on Salix aurita, and once on Rosa canina. Kinrara. Aug.

GALERA.

732. Sphagnorum, Pers. Bog at Manachie, &c. Oct.

STROPHARIA.

733. Jerdoni, Berk. On fir-stumps. Rothiemurchus. Sept. Rare.

HYPHOLOMA.

734. Capnoides, Fr. On fir-stumps. Sanquhar. Sept.-Oct.

CORTINARIUS, Fr.

735. Bolaris, Fr. Birch-wood. Aviemore. Sept. Rare. Verified by Berkeley.
736. Orellanus, Fr. Altyre woods. Sept.-Oct. Verified by Berkeley.

HYGROPHORUS, Fr.

737. Nitratus, P. Pastures at foot of Craigellachie Rock, Aviemore. Aug. Rare.

MARASMIUS, Fr.

738. Ramealis, Fr. Altyre and Greeshop woods, and in great masses on juniper at Aviemore. Aug.-Nov.
738*a*. Hudsoni, Fr. On holly-leaves at Sluie, 22d June 1878.

PANUS, Fr.

739. Patellaris, Fr. On cherry. Dunphail. 5th March 1877. Very rare. Verified by Berkeley.

TROGIA, Fr.

740. Crispa, Fr. On oak-stick, Sanquhar; and most abundantly on hazel-branches, Dunphail. Winter.

POLYPORUS, Fr.

741. Leucomelas, Fr. In fir-wood, near the Free Church of Rothiemurchus. Sept. Very rare. Only two specimens found. Verified by Berkeley.

742. Melanopus, Sw. On roots of trees in the ground. Kinrara, and Aviemore, beside Loch Baladren. Aug.-Sept. Rare. Verified by Berkeley.

743. Lacteus, Fr. Plentiful on birch in Darnaway woods, opposite Sluie. Sept. and Oct. Verified by Berkeley.

744. Keithii, B. and Br. On a fallen stick. Dunphail. Rare. (Ann. Nat. Hist., 1875.)

745. Micans, Ehrenb. On ash. Altyre. Nov. Rare. Verified by Berkeley.

746. Nitidus, Fr. On sticks. Darnaway and Dunphail. Winter. Frequent.

747. Vulgaris, Fr. On a paling-bar at Aviemore, and a stick in Darnaway forest. Autumn and winter. Verified by Berkeley.

TRAMETES, Fr.

748. Mollis, Fr. On birch at Cothall, and luxuriantly on cherry, Dunphail. Winter.

MERULIUS, Fr.

749. Rufus, Pers. On oak-sticks at Sanquhar, Dunphail, and Darnaway. Winter. Verified by Berkeley.

POROTHELIUM, Fr.

750. Keithii, B. and Br. Sanquhar and Dunphail. On fir-posts.

751. Confusum, B. and Br. On fir-sticks lying on the ground on Hill of Pitoulish. Sept. Frequent.

HYDNUM, L.

752. Ferrugineum, Fr. Fir-wood at Dell of Rothiemurchus. Aug.-Oct. Verified by Berkeley.

753. Scrobiculatum, Fr. Fir-woods at Grantown and Rothiemurchus. Aug.-Oct. Verified by Berkeley.

754. Zonatum, Batsch. Fir-woods at Grantown and Rothiemurchus. Aug.-Oct. Verified by Berkeley.

755. Cyathiforme, Schæff. Fir-wood at Rothiemurchus; only in one spot. Sept.-Oct. Verified by Berkeley.

SISTOTREMA, Fr.

756. Confluens, Pers. On the ground beside the Altyre avenue from Manachie. Sept. Rare.

RADULUM, Fr.

757. Deglubens, B. and Br. On ash-sticks at Sanquhar, Altyre, and Dunphail. Nov. Dec. Jan. Not rare.

PHLEBIA, Fr.

758. Radiata, Fr. On birch-branches. Darnaway wood, &c. Nov.-Jan.

GRANDINIA, Fr.

759. Granulosa, Fr. On fallen branches in various localities. Winter.

KNEIFFIA, Fr.

760. Setigera, Fr. On a stick, Darnaway. Verified by Berkeley.

CRATERELLUS, Fr.

761. Sinuosus, Fr. Craigellachie, Aviemore. Aug. Rare.

STEREUM, Fr.

762. Pini, Fr. On fir-branches lying on the ground. Aviemore.

CORTICIUM, Fr.

763. Salicinum, Fr. On Salix aurita. Kinrara. Aug.-Sept. Verified by Berkeley. Very Rare.
764. Læve, Fr. Cothall and Sanquhar. Winter. Verified by Berkeley.
765. Puteanum, Schum. On the under side of an elm-trunk lying on the ground. Sanquhar. Winter. Verified by Berkeley.
766. Byssoideum, P. On the ground among fir-leaves and under heaps of fir-branches, about Forres and Grantown. Winter. Common.
767. Aridum, Fr. On fir-deals at the moss-house beside Blair Chapel, &c. Winter.
768. Ferrugineum, Fr. On branches lying in a heap in Altyre woods. Oct. Verified by Berkeley.
769. Anthochroum, P. On birch-sticks. Altyre. Feb. Verified by Berkeley.

CLAVARIA, L.

770. Amethystina, Bull. In mossy meadows near Loch Alvie. Aug. Rather rare.
771. Vermicularis, Scop. Lawn at Altyre, &c. July, Aug.
772. Uncialis, Grev. On Heracleum stems in Greeshop wood. May.

TYPHULA, Fr.

773. Phacorrhiza, Fr. Among leaves near Cothall Cottage. Oct.

TREMELLA, Fr.

774. Viscosa, P. On sticks. Dunphail, &c. Winter and spring.
775. Torta, Willd. On oak-sticks. Altyre. May.

EXIDIA, Fr.

776. Saccharina, Fr. On fir-sticks at Forres and Kinrara.

RETICULARIA, Bull.

777. Atra, Fr. On fir-paling at Dalraddy, Alvie. Aug. Rare.

DIDYMIUM, Schrad.

778. Hemisphericum, Fr. On twigs. Common.
779. Farinaceum, Schrad. On decayed wood, leaves, &c. Common.
780. Cinereum, Fr. On wood. Dunphail. Feb.

PHYSARUM, P.

781. Nutans, P., var. aureum. On mossy stick, Sanquhar.
782. Rubiginosum, Chev. On Hypnum. Verified by Cooke.

STEMONITIS, Gled.

783. Ferruginea, Ehrb. On a plant in a stove at Gordon Castle. J. Webster.
784. Obtusata, Fr. On a stick. Banks of Findhorn. Verified by Berkeley.

TRICHIA, Hall.

785. Nigripes, P. On rotten wood. Greeshop.
786. Turbinata, With. On rotten wood. Common. Verified by Berkeley.
787. Serpula, P. On fallen leaves. Cluny Hill.

LINDBLADIA, Fr.

787*a*. Effusa, Ehb. On sawdust, Rothiemurchus and Dallas. Aug.-Sept.

PHELONITIS, Chev.

788. Strobilina, P. On cones of spruce. Altyre, &c.

LEPTOSTROMA, Fr.

789. Spiræa, Fr. On dead stems of Spiræa. Common.

SPHÆROPSIS, Lev.

790. Malorum, Berk. On apples.

ACROSPERMUM, Tode.

791. Compressum, Tode. On nettle-stems. Sanquhar and Greeshop.

DIPLODIA, Fr.

792. Vulgaris, Lev. On Prunus padus twigs.

HENDERSONIA, Berk.

793. Arundinacea, Desm. On dead Arundo stems, Kinrara. Verified by Plowright.
794. Rosæ, West.; Bull. de Brux. On rose-stems.

DARLUCA, Cast.

795. Filum, Cast. On Uredo fallens on Anthyllis vulneraria, at Findhorn and at Rothiemurchus.

SEPTORIA, Fr.

796. Ulmi, Kze. On elm-leaves.
797. Castanæcola, Desm. On chestnut-leaves.
798. Graminum, Desm. On grass.

EXCIPULA, Fr.

799. Macrotricha, B. and Br. On dead broom-branches.

DINEMASPORIUM, Lev.

800. Graminum, Lev. On leaves of grass.

ASTEROMA, D.C.

801. Ulmi, Kl. On elm-leaves. Sanquhar. Sept.
802. Rosæ, D.C. On rose-leaves. Oct.

STEGANOSPORIUM, Cda.

803. Cellulosum, Cda. On stick. Sanquhar.

TORULA, Pers.

804. Herbarum, Lk. On stems of Umbelliferæ.
805. Ulmicola, Rbh. On elm-bark. Verified by Plowright.
806. Splendens, Cooke. See Grevillea, vol. iii. p. 178. On oak-bark. Drumduan.

SPORENDONEMA, B.

807. Casei, B. and Br. On cheese.

SEPTONEMA, Cda.

808. Elongatispora, Preus. On nettle-stems. Greeshop.

SPORIDESMIUM, Link.

809. Alternariæ, Cooke. On wall-paper in Manse of Forres.

PUCCINIA, Pers.

810. Luzulæ, Lib. On Luzula campestris. Aviemore. Aug.-Sept.
811. Bistortæ, D.C. On Polygonum viviparum. Aviemore. Aug.
812. Polygonorum, Link. On Polygonum amphibium. Invererne.
813. Scorodoniæ, Link. On Teucrium scorodonia. Kinrara.
814. Andersoni, B. and Br. On leaves of Cnicus heterophyllus. Greeshop and Rothiemurchus.
815. Cirsii, Fckl. On leaves of Cnicus heterophyllus. Greeshop.
816. Umbelliferarum, D.C. On Bunium flexuosum. Greeshop. May.
817. Lychnidearum, Lk. (Uredo spores.) On Lychnis. Edgefield.
818. Saxifragarum, Schl. On Adoxa moschatellina. Sanquhar. May.
819. Fallens, Cooke (Uredo spores). On Anthyllis. Findhorn and Aviemore.

GYMNOSPORANGIUM, D.C.

820. Juniperi, Lk. On juniper. Sanquhar. June.

UROMYCES Lev.

821. Appendiculata, Lev. On Orobus. Rothiemurchus. Aug.
822. Concentrica, Lev. On Hyacinth. Darnaway. June.
823. Polygoni, Fckl. On stems of Polygonum aviculare. Edgefield. Sept.

PROTOMYCES, Unger.

824. Chrysosplenii, B. and Br. On Chrysosplenium. Banks of Findhorn.
825. Microsporus Ung. On Ranunculus ficaria. Sanquhar.

COLEOSPORIUM, Lev.

826. Petasitis, Lev. On Petasites vulgaris. Invererne. Sept.

UREDO, Lev.

827. Confluens, D.C. On Mercurialis perennis. Banks of Findhorn, &c. June.

ÆCIDIUM, Pers.

828. Orobi, D.C. On Orobus tuberosus. Grantown. Aug.
829. Saniculæ, Carm. On Sanicula Europæa. Grantown. Aug.
830. Menthæ, D.C. On mint in a garden. Forres. May.

CRYPTOGAMIC SOCIETY OF SCOTLAND.

The Fourth Annual Conference will take place, under the presidency of Professor Balfour, in the Royal Botanic Garden, Edinburgh, on October 9, 10, and 11. The Business Meeting will be held on the 9th, at 1.30 P.M., in the Lecture Hall. On the 10th an Excursion will be made, and on the 11th an Exhibition of Cryptogamic Plants in the Herbarium Hall. The meeting promises to be successful. Any information desired may be obtained from Dr Buchanan White, Perth, Secretary of the Society.

GEOLOGY.

THE GOLD-FIELD AND GOLD-DIGGINGS OF CRAWFORD-LINDSAY (LANARKSHIRE).

By W. LAUDER LINDSAY, M.D., F.R.S.E., F.L.S.

(*Continued from page* 317.)

SINCE the last instalment of these contributions to the Civil and Natural History of the Crawford-Lindsay gold-diggings and district was written,[1] there has been published in Edinburgh a work which is sure to take its place at once as a standard one on the subject of which it treats. I refer to Mr Cochran-Patrick's 'Records of Mining in Scotland.'[2]

Before discussing further the subject of the present series of papers, it is obviously desirable to pause for the purpose of inquiring whether the important work in question throws any new light, or light at all, on the puzzles that have engaged our attention: for instance, on the determination of the question whether *auriferous quartz* exists, and was mined in the olden time, in any part of the Crawford-Lindsay district.

It may be stated at once that these 'Early Records' do not furnish us with any new fact of importance, though they may assist in the new interpretation of old facts, by furnishing what will probably henceforth be regarded as the correct or official reading of certain interesting old chronicles.

Mr Cochran-Patrick's 'Records' are valuable[3] chiefly for—

1. The early history of the Scotch gold-mines given in the "Introduction."

[1] 'Scottish Naturalist,' vol. iv. p. 305.

[2] 'Early Records relating to Mining in Scotland:' collected by R. W. Cochran-Patrick of Woodside, LL.B. Cantab., F.S.A. Scot. Edinburgh: David Douglas. 1878.

[3] In a letter of date Feb. 1878, he says: "In dealing with the 'Records,' I have given them as they stand—*verbatim;* leaving to those who have, like yourself, specially studied the subject from a geological point of view, to say whether the conclusions arrived at by the old searchers are true or not."

2. The Report on the Gold-Mines of Crawford Moor contained in MS. in the British Museum Library (Harleian MSS.), and which I have described in these papers as the "Cottonian MSS.,"[1] and their anonymous author as the "Cottonian Reporter."[2] According to Mr Cochran-Patrick, these valuable fragments of MS. "were written apparently either by *Bowes* or one of his party," which would make their date about the beginning of the seventeenth century.[3]

3. The Reports of his gold-digging operations about Wanlockhead by *Bowes* himself, of date 1604.

4. The Act of Parliament in favour of Stevin Atkinson, of date June 1616.

This Act refers to the "extraction" of gold: a phrase which might refer equally to surface soil or drift as to rock *in situ*. The King's[4] object in granting the Act was obviously the discovery of a "vaine" of gold or gold-quartz ('Records,' p. 168); and this was the object equally of the operations of Bowes, Bulmer, and the other mining engineers or gold prospectors whose names have been already specified.[5]

5. The Royal Lease to Dr Hendlie in 1621, which specifies ('Records,' p. 170), "minerall gold or gold vre lyand within the seames or vaynes, or dispersit in the earth."

6. The Royal Contract with Cornelius de Vois, of date March 1567.

7. The Act of Parliament in favour of Thomas Foullis, Goldsmith, Edinburgh, dated January 1593.

8. The Act of Parliament of 1424, claiming all gold-mines for the King.

The only evidence contained in Mr Cochran-Patrick's 'Early Records' of the occurrence of *aurifcrous quartz* in the Wanlockhead district is the following: He says that by Bulmer "a piece of Sapper-stone[6]—probably quartz—was found at Longcleuchhead, weighing 2 lb., from which, when it was broken, 1 oz. of gold was taken" (Introduction, p. xix). An anonymous letter,

[1] In a letter of same date Mr Cochran-Patrick tells me that this MS. is often quoted, "but it is only a fragment, having been much injured in the fire of 1726. I have, however, printed the *complete text* from another copy taken before the MS. was injured, or perhaps from the original from which the other was a copy."

[2] *Vide* 'Scottish Naturalist,' p. 265.

[3] Ibid., p. 259.

[4] James VI.

[5] Ibid., pp. 258-262.

[6] *Vide* 'Scottish Naturalist,' p. 308, footnote.

contained in the Public Record Office, London, of date January 1604, says of Bulmer's finds: "There be some peeces of stone or spar also wth gold in them, as it weare ye utmost sprigges of greater branches and ye body of a mine wch they seeke for" ('Records,' p. 116).

Bowes "discovered a vein of ore from which some small amount of good-like gold was obtained; but it is doubtful, from his description, whether the metal had not been washed in by the water-courses made for the purpose of tearing up the ground" (Introduction, p. xx).

The Cottonian Reporter tells us that "Theis Reasones persuade me that theare are vaines of gold in sundry partes of Crawforde More" (Introduction, p. xxx).

But the same Reporter makes a prior and counter statement entitled: "Theis Reasones make me doubtefull that the gold is not in vaynes, bet rather lyenge dispersed in chevore rockes, neare the topes and heighte of the mountaynes" (Introduction, p. xxix).

Whatever may have been the ground for the belief, it is notorious that a belief existed in the sixteenth and seventeenth centuries as to the occurrence of "vaines" of gold or gold-quartz in the Crawford-Lindsay district; and this belief was quite as strong and as striking on the part of successive kings of Scotland —at least of James V. and VI., and of their Parliaments, English and Scotch—as on that of the various gold prospectors, mining engineers, and miners, who were then engaged in the development of the auriferous resources of 'God's Treasure-House in Scotland.'

Bowes repeatedly confesses that his object at Crawford Moor was the "discoverie of a vaine of golde." "If any vaine there (God willinge), I shall finde it," says he ('Records,' pp. 107 and 105). His "travill onelye tending for discouverie of a vaine of gold," he explains ('Records,' p. 108).

It is evident that Bowes bestowed much pains on his search for the said "vaine,"—that is, for gold-quartz *in situ;* and he details, in his various letters or reports to the Earl of Suffolk, Lord Elie, Lord Essenden, and other members of the English Parliament, his many efforts to find it. But in a multitude of ways he confesses the failure of his efforts and the disappointment of his hopes. Thus he says he has found sundry "strange myneralls stones, but not any gold fixed or growing in those leaders or

mothers"—that is, in veins containing "fixed lead ore, and some marquesitt, accompanied wth keele, sparr, and brimstone" ('Records,' p. 114).

He disclaims distinctly having "found a vaine of gold," and complains of having been credited, or discredited, with such a discovery; for he felt keenly that, had the discovery been a reality, he would have been culpable for making no return, or no adequate return, in produce to the anxiously expectant, probably impatient and suspicious King. Hence he specially reports to Lord Essenden, on behalf of the King and Parliament, dating from "Codrus Cottage, High Winlocke Water," the real nature of his operations and their unsatisfactory results ('Records,' p. 112).

He refers to a "supposed vaine" ('Records,' p. 109), and he gives it as his opinion that the character of the nuggety gold which he found, like so many "diggers" both before and since his day, proved that it was not of strictly local origin. This, at least, is what he appears to mean when he says, "w^ch^ (in my conceivinge) doth approve this gold grewe not in y^t^ place where I found it" ('Records,' p. 104).

He thus refers further to the distant nativity, the travelled character, of the Wanlockhead gold nuggets: "Upon better triall I am satisfyed that they have not their natural growing in that place, but are accidentallye brought thether." He is both sanguine, courageous, and persevering enough to promise "eyther to pervaile in fyndinge whether it grew in a vaine, or, if not in vaines, to fynd the beds wherein it doth growe or lye" ('Records,' p. 109).

But neither Bowes nor any of his equally hopeful, brave, and hard-working predecessors or successors, appear to have really discovered *auriferous quartz-veins* or gangues.

Before we leave Bowes, with his hopes and disappointments, and his instructive descriptions of gold-searching or mining operations, it is of interest to note that even in his time—about the end of the sixteenth and beginning of the seventeenth centuries—the nefarious operation of "salting" with foreign gold or gold-quartz the Crawford-Lindsay district—as this operation has been described by Messrs Greg and Lettsom[1]—would appear to

[1] *Vide* 'Scottish Naturalist,' p. 315, footnote. Scottish mineralogists would appear to be subject to imposition by other nefarious practices on the part of dealers in minerals; for Professor Heddle denounces "the purchase, at fabulous prices, of *loose specimens* from too frequently *falsified localities*." ["County Geognosy and Mineralogy of Scotland," 'Mineralogical Magazine,' April 1878.]

have been known. For he tells us that he disdains to "bye gold and make show thereof as gotten in these workes" ('Records,' p. 108).

Since the last of the present series of papers was written (for the July No. of the 'Scottish Naturalist'), an important meeting has been held in London—important in so far as concerns our present subject, the Crawford-Lindsay gold-field, and its auriferous produce, actual and possible. I allude to the annual meeting of the Directors and Shareholders of the "Leadhills Silver-Lead Mining and Smelting Company" in June. The chairman stated: "With respect to the presence of *gold* in the property, it was said that old workers, with their rude tools, had taken £500,000 worth of gold out of the mine; and surely a company, with improved modern appliances, ought to develop this part of their property."[1] This £500,000 has a suspicious resemblance to the valuation of the Crawford-Lindsay gold produce by Calvert, which was £515,000.[2]

Such a mining company as that above mentioned has it in its power to determine two points of great interest, socially or economically, as well as mineralogically or geologically, viz.:—

1. Whether it will "pay" nowadays to conjoin the extraction of alluvial gold from the soil, or of disseminated gold from auriferous quartz, with the desilverisation of lead and the smelting of the lead itself?

2. Whether such disseminated gold and gold-quartz really exist—that is, auriferous quartz *in situ*, and forming veins in the lower Silurian rocks of the Wanlockhead district?

If the Leadhills Silver-Lead Company will undertake the solution of these problems by any kind of systematic operations on a large scale, its directors will deserve well of their countrymen, whatever be the result of the experiment.[3]

From the data set before the reader in the present and three foregoing papers,[4] it would appear impossible to determine that *gold-quartz in situ* was ever really found at Wanlockhead or Leadhills; or if it was so found, what was its mineralogical or petrological character. Statements concerning stamping mills, "vaines of gold," and gold-bearing rocks, stones, or minerals, are flatly contradicted by other allegations of an entirely opposite

[1] 'North British Daily Mail,' June 7, 1878.

[2] '*Vide* his 'Gold Rocks,' p. 165, and the 'Scottish Naturalist,' p. 264.

[3] *Vide* 'Scottish Naturalist,' pp. 213, 214.

[4] In the January, April, and July Nos. of the 'Scottish Naturalist.'

character, involving denial that the most painstaking search ever succeeded in demonstrating the occurrence of gold in "solid places," "beds," "seames," or "vaines"—that is, in any kind of rock *in situ*.

Nor is it surprising, considering the mixture of fiction with fact; the infusion of narrative with superstition, credulity, prejudice, ignorance; the use of a technical, partly local, partly foreign jargon, long since obsolete, and now scarcely intelligible, that characterised the quaint old chronicles of the sixteenth and seventeenth centuries, that difficulty should exist—and of an insuperable kind, apparently—in reconciling the conflicting evidence, or of collecting evidence at all of a satisfactory kind.

But it *is* not a little surprising that such a difficulty—and quite as great, apparently—should exist at the present day, or should have existed in quite recent times. That it does exist, evidence was furnished in the last instalment of these contributions,[1] in the discrepant evidence of Professor Harkness, Professor Geikie, Dr Wilson, Mr Dudgeon, and the Rev. Dr Porteous, regarding the auriferous quartz of the Wanlockhead district.

The amazing difficulty of obtaining, in the first place, simple evidence as to the *facts* of a find; the impossibility sometimes of so sifting a superabundant mass of evidence as to ascertain what is trustworthy; the niceties involved in striking the balance of probability when evidence is conflicting and bewildering; the discrepancies in opinion between experts themselves, and the greater and radical differences between scientific and practical men; the frequent errors of the former, the *savants*, and the equally common correctness of the views of the latter, the mere miners or diggers,—all become more prominent, more fully illustrated in connection not only with a special subject, but with a special object; not only with the determination of what appears to be a very simple matter—viz., whether *auriferous quartz* exists in a given district, but with the even simpler matter at first sight —viz., whether a given piece of gold-quartz is or is not the produce of—native to—a certain locality.

Hence it is that all these or other difficulties, dubieties, or perplexities have arisen in connection with three now well-known *museum specimens of gold-quartz*—all of them labelled or described as having been not only found at, but as being indubitable natives of, Wanlockhead, Dumfriesshire, or Leadhills, Lanarkshire. The

[1] *Vide* 'Scottish Naturalist,' pp. 315-317.

three museum exhibits in question are—in the order of the dates of their discovery or of presentation—the following:—

1. In the Museum of Science and Art, Edinburgh: a small piece of auriferous quartz labelled as of date 1837. For the sake of brevity and convenience, and for the reasons that will appear in the sequel, I shall henceforth speak of this exhibit as the *Jameson specimen.*

2. In the British Museum, London: a larger piece, not, however, richly auriferous, bought in the district by Mr Bryce Wright of Great Russell Street, London, and sold by him to the said Museum in 1864. I shall hereafter refer to this exhibit as the *Wright specimen.*

3. In the Museum of Science and Art, Edinburgh, another large piece containing a considerable amount of gold, labelled as having been found by *Andrew* Gemmell,[1] miner, in 1872, and presented in 1877. I have, in various publications on the gold-fields of Scotland, spoken of this exhibit as the Gemmell quartzite, and shall hereafter, for the sake of uniformity of nomenclature, refer to it as the *Gemmell specimen.*

By far the most important of these exhibits, from all points of view, is the last-named. But I do not propose describing or discussing *it* in the present paper, for the following reasons, *inter alia*:—

1. It has already this year formed the subject of debate before the Royal Society of Edinburgh[2] and the Geological Society of Glasgow,[3] as well as more publicly in the leading newspapers of Edinburgh, Glasgow, and Dumfries.[4]

2. Some of the debaters introduced the irrelevant and mischievous element of personalities: in other words, finding their position unprovable and untenable, they substituted for fact or legitimate argument vilification of those whose position was too obviously that of common-sense. And it is extremely difficult, if not impossible at present, to criticise or analyse the singular history of the *Gemmell specimen* without still further rousing the

[1] It was not, however, found, as represented, by *Andrew* Gemmell, but by his son *George*, as is pointed out in an excellent *résumé* of the history of the Gemmell find given in an anonymous letter in the 'North British Daily Mail' (Glasgow) of May 16, 1878, by "A Native" of the district, probably a lead-miner, who shows, whatever he is, an intimate acquaintance with Wanlockhead and its doings.

[2] On March 4, 1878. [3] On March 7 and 21, 1878.

[4] Especially the 'Scotsman,' 'North British Daily Mail,' and 'Dumfries Herald.'

passions of some of those who believe it to be native, seeing that such a criticism or analysis would have the effect of exposing the pitiable want of proof, or anything thereto approaching, that has as yet characterised the advocacy of its Scotch nativity.

3. A good deal remains to be said concerning the supposed nativity of the Gemmell specimen, including a good deal that is new; for there can be little doubt that the public discussions regarding it that have been above adverted to have already led to careful gold-prospecting of the Wanlockhead district, and will direct attention to the possible occurrence of *auriferous quartz* in other parts of Scotland. The Gemmell specimen, indeed, raises questions of such importance, not only to the mineralogist or geologist, but to the historian, archæologist, and jurist, and to all who are interested in the development of the industrial resources of Scotland, that these questions will require at some future date a special paper, or perhaps a series of papers, for their due discussion.[1]

At a meeting of the Royal Society of Edinburgh in March last (1878), much stress was laid on the value and significance of the *Jameson specimen*. Mr Dudgeon of Cargen mentioned "the fact that there had been for many years, in the Museum of Science and Art, a specimen (of auriferous quartz) labelled Wanlockhead. This quartz was in the collection at the time of Professor Jameson; and it was perfectly certain that, had there been doubt as to its real character, it would not have been admitted to the Museum by so eminent a mineralogist." Professor Archer, Director of the Museum, remarked in confirmation: "It was scarcely necessary . . . to say that Professor Jameson was not likely in his time to admit an Australian specimen; and he (Professor Archer) did not hesitate to say that any one who looked at the two specimens (the Jameson and Gemmell ones) would be convinced that they were got at the same place"[2]—viz., Wanlockhead. No doubt it is true that "Professor Jameson was not likely, *in his time*, to admit an *Australian* specimen" of gold-quartz into the Natural History Museum of the University of Edinburgh, because the Australian gold-diggings did not begin till 1851;[3] while in 1847, when I attended what should have been

[1] Mr Cochran-Patrick's judicial verdict on the Gemmell specimen is this: "Mr Dudgeon of Cargen . . . figures a mass of quartz and gold, which was supposed to have been found near Wanlockhead, though some doubt has been thrown on its native origin."—'Early Records,' Introduction, p. xx, footnote.

[2] 'Scotsman,' March 5, 1878. [3] *Vide* Calvert's 'Gold Rocks,' p. 18.

Professor Jameson's class at the said university, he was certainly not in a condition to decide upon the nativity of a piece of gold-quartz, and could not have been for some years previously to 1847.

I examined all[1] the specimens of Scotch gold in the Museum of Science and Art, Edinburgh, in July 1877, under the auspices of Professor Archer himself, taking notes at the time of their characters. Among others, I found an angular lump of auriferous quartz labelled as "from Leadhills, Scotland," 1837. It was duly enumerated among other "Museum Specimens of Native Scottish Gold," in a paper bearing that title submitted to the Geological Society of Edinburgh in December 1877, my comment upon it being that it has more appearance of weathering than the Gemmell specimen, but contains a small quantity (in specks) of apparently the same sort of gold.

When on a former occasion, some years previously, I inspected all the Scotch gold exhibits in the same Museum, I found what I described at the time[2] as "two small nuggets labelled Native Gold in Quartz: Leadhills, 1837 (Traill). Here the quartz is still adherent, just as it is in nuggets from the Waipori diggings of Otago, N.Z." [3]

The specimen I saw in 1877 labelled "Leadhills, 1837," may or may not be the Jameson specimen referred to by Mr Dudgeon. The introduction of Professor Traill's name only adds to the puzzle. When I attended the Natural History Class of the University of Edinburgh in 1847, Professor Traill was the substi-

[1] Nevertheless, I am told that there is one specimen which I did not see, and which, if so, must be exhibited in a different part of the Museum—viz., what it will be convenient to speak of as the *Martin nugget*, from the name of the gentleman, the late Dr Martin of Leadhills, by whose son it has been lent to the Museum. [*Vide* Dr Porteous's 'Treasure-House,' p. 51, and letter on the gold of Wanlockhead and Leadhills in the 'Scotsman' of January 4, 1878. On application to Mr Galletly, Sub-Curator of the Museum, I found my surmise correct: for he was good enough to explain, in a memorandum of date July 1878, that "the specimen of Native Gold which belonged to the late Dr Martin of Leadhills, and was lent to us by his son, is shown in a case containing models of large nuggets, auriferous quartz, &c., in what is called the Metallurgical Hall of the *main floor* of the building here;" while the other specimens of Scotch gold are to be found in the gallery above.

[2] *Vide* paper on "The Gold-Fields of Scotland," in the 'Journal of the Royal Geological Society of Ireland,' vol. ii., 1869, p. 180, footnote.

[3] Or as has been described in Wanlockhead Nuggets in the 'Scottish Naturalist,' p. 211.

tute of Professor Jameson as lecturer. Among the many questions in natural history in which Professor Traill took an interest was that of native gold; and he is credited with having, in 1802 or 1803,[1] "found gold in a vein of quartz *in situ* at Wanlockhead."[2] But I have never met with anything like proof or evidence that he did so.

Mr Dudgeon assures us[3] that "several specimens of *auriferous quartz* have been found besides the Gemmell specimen. One is now in the Museum of Science and Art in Edinburgh;[4] another was obtained in the district by the late Professor Traill; a third was got a good many years ago in a very singular manner by Professor Heddle, who was fishing in the Glengonar water. His hook became entangled, and, on pulling up his line, he brought up a stone, which proved to be a piece of quartz containing gold. This also got into Dr Traill's hands, and both these last specimens, on his (Professor Traill's) death, were sold, with the rest of his collection, in Liverpool, and all trace of them is lost."

In many museums, especially private ones, it is common to have a catalogue, written or printed, containing a history of the individual exhibits; and, in the case of such an exhibit as the Jameson specimen of gold-quartz, a proper catalogue would detail the circumstances under which it was found—those that would prove it to be a native of the Leadhills district. But I am not aware that, as concerns the Jameson specimen, any such history or proof is forthcoming; and in its absence it is obviously impossible to found anything upon such a specimen, and on such a label[5] as it possesses.

Of the *Wright specimen* in the British Museum, on the other hand, a good deal is known; but the information at command is not sufficient to enable the unbiassed student of his country's mineralogy to decide whether the specimen is *native or foreign.*

[1] Greg and Lettsom's 'Manual,' p. 236, speaks of Professor Traill's specimen of 1802 as the only specimen of gold found (up to 1858) in the matrix in Scotland.

[2] *Vide* paper already quoted in the 'Journal of the Royal Geological Society of Ireland,' p. 180.

[3] In a letter published in the 'Dumfries Herald' of March 28, 1877.

[4] Alluding, apparently, to the Jameson specimen.

[5] Descriptive printed labels are also common in museums, and are extremely useful where their information is accurate. The Gemmell specimen has a short descriptive printed label, of which I have a duplicate. But it furnishes no evidence that the specimen is a native of the district in which it was found.

Mr Wright's own account of the find has been very recently made public,[1] and is as follows:—

"Whilst at that locality [Leadhills] many years ago, a miner brought me the specimen in quartz, saying he had just discovered[2] it between Elvanfoot and Leadhills. I immediately put a series of questions to him, and was convinced in my own mind that he was speaking strictly the truth. I obtained the specimen, and within the same hour walked to Wanlockhead to compare it with some specimens from California which I knew to be in the possession of the postmaster, a Mr Laidlaw. My comparison convinced me that it was a genuine Leadhills specimen. I do not remember now the name of the miner; but on my first visit to the Leadhills I will doubtless be able to ascertain.

"Allow me . . . to state that, having passed my whole life in the study of mineralogy, and that, being conversant with gold in every known form, and perhaps from every locality—including Australia, Siberia, Siam, Africa, Brazil, Bolivia, Transylvania, as well as the United Kingdom (Wales, and Wicklow, Ireland)—I am not likely to have been deceived by an *Australian* specimen being passed off to me as a genuine Leadhills one."

But obviously the mineralogical authorities of the British Museum do not regard the Wright specimen as an indubitable native. Desirous of having, in the event of the specimen being regarded native by the Museum authorities, a coloured drawing made of it, in order to its publication as an illustration of some of my future papers on the gold and gold-fields of Scotland, I applied, in April last, to the Keeper of the Department of Mineralogy in the said Museum, who happens also to be Professor of Mineralogy in the University of Oxford—viz., Professor Maskelyne. He was good enough to write me (of date April 1878): "There would be no difficulty in your having any of the gold specimens from Scotland drawn. . . . The specimen you allude to has only the late Mr Bryce Wright for its godfather. It might be *Austra-*

[1] In a letter by him to the 'North British Daily Mail' of March 25.

[2] Such discoveries would appear to be by no means unfrequent. A correspondent at Wanlockhead, writing in July last (1878), tells me: "Another piece of gold-bearing quartz has been found in the Wanlock glen, a little below the village. It is about the size of a pigeon's egg, with richer gold than the Gemmell find. . . . I have not seen it; but I am told that it does not appear to have been broken from any solid body for a very long time." It is said to be in the possession of Dr Wilson of Wanlockhead.

lian;[1] and it has always been doubtful whether it was not. . . . The so-called Wanlockhead bit of quartz, apart from the doubt as to its origin, has but a speck of gold on it, and would be hardly worth figuring."

The opinion of the assistant-keeper of the same department—Thos. Davies, F.G.S.—as to the probably Australian origin of the Wright specimen, is quoted by the Rev. Dr Porteous,[2] and is as follows:—

"The specimen in massive quartz-rock in our collection I suspect to be Australian. We had only the dealer's assurance that it was purchased out of an old collection made in the Wanlockhead district. The specimen is about 5 inches × 2 × 2, and contains but little gold in one or two places. It consists of massive quartz, without any other rock whatever, and may have been part of a vein, judging from the appearance of one of its sides. . . . The specimens of gold from Wanlockhead were purchased of Mr Wright, a London dealer in minerals, in 1864."[3]

Desirous of knowing the grounds of his suspicion as to its Australian nativity, I applied to Mr Davies himself in March last; and the following was his prompt and courteous explanation (of date March 1878):—

"I was only led by the great similarity of the quartz to that from Australia, and that we had but the word of Mr Bryce Wright, senr., that it was from that locality (Wanlockhead), the label accompanying the two specimens appearing to refer only to that in grains. The gold is plainly visible upon one corner of the specimen."

[1] The liability of Australian to take the place of native gold-quartz in our public museums was specially pointed out in an article on "Australian Gold-Quartz in Scotland. By our Gold Commissioner on the Sutherland Gold-Field in 1869," 'Northern Ensign' (Wick), April 25, 1878.

[2] 'God's Treasure-House,' p. 53.

[3] In a memorandum from Mr Davies, of date July 1878, he says the specimen "was sold here by *the late* Bryce Wright, *senr.*, in June 1864. He said that it was out of an old collection; and the label accompanying the specimen was not in his handwriting, nor in that of any member of his family." It is not a little singular, then, that *the present* Mr Bryce M. Wright, *junior*, describes himself—as we have seen—as first the purchaser, and next the vendor, of the Wright specimen.

REVIEWS.

European Butterflies and Moths. Parts I.-VI. By W. F. Kirby. Cassell, Petter, & Galpin. 4to. 1878.—The British collector of Lepidoptera as a rule cares little, and knows perhaps less, about any species that does not occur within the limits of the United Kingdom. In fact he carries his love of native productions so far as to gladly give as many shillings for a specimen "guaranteed British" as an example from the other side of the Straits of Dover would bring pence. A canny Scot, who combines insect-collecting with his other avocations, has recently tried to cultivate this peculiar trait of the British collector's character by offering specimens of a certain moth at prices ranging from £6 to £20—excellent but foreign specimens of the same insect being obtainable for two or three shillings. We do not blame our 'cute countryman, but we strongly deprecate the narrow-mindedness of collectors. It is true that hitherto there was no work in the English language (if we except Mr Kirby's 'Manual of European Butterflies') which treated of the European Lepidoptera; but that excuse can no longer be pleaded, since the enterprise of Messrs Cassell & Co. has placed within the reach of every collector, in a popular (yet scientifically true) form, an illustrated handbook of the European species. The work is based upon Berge's 'Schmetterlings-Buch,' and the coloured plates, which are wonderful for the price, are reproduced from that work. The publishers have been fortunate in securing the services of Mr W. F. Kirby, whose name alone is guarantee that the text will be good. In the plates the more notable species are figured, as well as, in many cases, the caterpillars and pupæ, and the plants on which the former feed. The distribution of the various species is also noticed, though we think that Mr Kirby is perhaps a little too anxious to include as many species as possible in the British fauna; for he says (p. 15) of the very doubtfully British *Melitæa didyma* that a specimen "was recently taken in Scotland"—a statement which has, in our opinion, too slight a foundation.

Either to the young collector who wishes to make acquaintance with the Lepidoptera of his own country, or to the older one who desires to extend his information beyond the limits of the British species, we can heartily recommend this work.

The Fauna of Scotland, with especial reference to Clydesdale and the Western District. Hymenoptera. Part I. By Peter Cameron. Published by the Natural History Society of Glasgow. 8vo. Pp. 52. 1878.—Holding, as we do very strongly, that the proper work of local societies is the compilation of local Floras and Faunas, we hail the appearance of this work as a step in the right direction. The Society contemplates publishing a series of catalogues of the Fauna of Scotland, and has secured for many of the groups the services of zoologists especially interested in them. The part now published is much more than a mere catalogue, as it contains numerous valuable remarks and notes upon particular species (with descriptions of some new ones), distribution, &c., of the Sawflies, to which group this part is restricted. We cannot do less than wish the Society all success in its very laudable undertaking.

ZOOLOGICAL

INSECTA SCOTICA.

THE COLEOPTERA OF SCOTLAND.

(*Continued from p.* 276.)

EDITED BY D. SHARP, M.B.

RHOPALODONTUS Kies.

PERFORATUS Gyll. Very rare. Highland.
DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o o

OCTOTEMNUS Mell.

GLABRICULUS Gyll. In *Polypori*. Local.
DISTRIBUTION—EAST. o Forth ♀ ♀ Moray o o o
WEST. o o o o o

TENEBRIONIDÆ.

BLAPS Thoms.

MUCRONATA Latr. In bakehouses. Probably common.

DISTRIBUTION—EAST. ♀ ♀ Tay ♀ Moray o o o
WEST. Solway ♀ o o o

MORTISAGA L. Very rare. In outhouses.
DISTRIBUTION—EAST. o o Tay o Moray o o o
WEST. o o o o o

SIMILIS Latr. Rare. In outhouses.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

HELIOPATHES Thoms.

GIBBUS Fab. Maritime. Very rare.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway Clyde o o o

BOLITOPHAGUS Thoms.

RETICULATUS L. Rare. Highland.
DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o o

TRIBOLIUM Thoms.

FERRUGINEUM F. Probably only occasionally introduced.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o ꝏ o o o

ALPHITOBIUS Steph.

DIAPERINUS Panz. In bakehouses.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway Clyde o o o

PICEUS Ol. In bakehouses.
DISTRIBUTION—EAST. o o o o o o o o
WEST. Solway o o o o

TENEBRIO Thoms.

MOLITOR L. In bakehouses.
DISTRIBUTION—EAST. o Forth o o o o o o o
WEST. Solway ꝏ o o o

OBSCURUS F. In bakehouses.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o o o o o

HELOPS Har.

STRIATUS Fourc. Rare. On trees.
DISTRIBUTION—EAST. ꝏ Forth o o o o o o
WEST. Solway o o o o

CISTELA Thoms.

MURINA L. Local. Maritime.
DISTRIBUTION—EAST. ꝏ ꝏ ꝏ Dee ꝏ o o o
WEST. ꝏ ꝏ o o o

PYTHIDÆ.

PYTHO Thoms.

DEPRESSUS L. Local. Highland. Under bark of Scots fir.
DISTRIBUTION—EAST. o o Tay Dee o o o o o
WEST. o o o o o

SALPINGUS Thoms.

ATER Payk. Rare.
DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway Clyde o o o

ÆRATUS Muls. Very rare.
DISTRIBUTION—EAST. Tweed o o o o o o o
WEST. o o o o o

Found at Girrick by Mr Hislop.

CASTANEUS Panz. On dead branches of Scots fir.
DISTRIBUTION—EAST. Tweed Forth Tay Dee Moray o o o
WEST. Solway ♀ o o o

RHINOSIMUS Thoms.

RUFICOLLIS L. Rare.
DISTRIBUTION—EAST. o o ♀ Dee o o o o
WEST. Solway Clyde o o o

VIRIDIPENNIS St. Rare.
DISTRIBUTION—EAST. ♀ o o Dee o o o o
WEST. o o o o o

PLANIROSTRIS Fab. Common.
DISTRIBUTION—EAST. ♀ Forth Tay ♀ ♀ o o o
WEST. Solway ♀ o o o

(*To be continued.*)

END OF VOLUME IV.

PRINTED BY WILLIAM BLACKWOOD AND SONS.

No. XXV. JANUARY, 1877. Vol. IV.

"Time's glory is
To unmask falsehood and bring truth to light."

THE SCOTTISH NATURALIST

Edited by F. Buchanan White, M.D., F.L.S.

CONTENTS.

	Page
Zoology—	
Further Remarks on Animal Psychosis *(continued)*,—Rev. J. Wardrop,	1
Bird-names in Orkney,—James W. H. Trail, M.A., M.B., F.L.S.,	9
On the occurrence of Picus major Lin. (Greater Spotted Woodpecker) in Aberdeenshire, and its Habits and Food,—Id.,	10
Migration of the Starling,—R. Herdman,	10
Kites,—Id.,	10
Sphinx convolvuli,—Alexander Paterson, M.D.,	10
Tenthredinidæ in Braemar,—P. Cameron,	10
Notes on Scotch Hymenoptera,—Id.,	11
Capture of Catocala fraxini in Berwickshire,—W. Shaw,	12
Catocala nupta,—Id.,	12
Pachnobia hyperborea var. alpina,—F. Buchanan White,	12
Phytology—	
Scottish Galls,—James W. H. Trail, M.A., M.B., F.L.S.,	13
Observations on the Recurrence of the Rarer Fungi—Rev. John Stevenson,	18
Cryptogamic Society of Scotland,	22
On Uredo filicum Desm. and Uredo? pteridum n. sp.,—Dr. Buchanan White,	26
New or Rare Lichens,—J. Stirton, M.D., F.L.S.,	27
Convolvulus arvensis as an unintended ornamental climber,—W. Herdman,	30
Note for Mycolologists,—Rev. J. Stevenson,	30
Rare Fungi from Glasgow Botanic Gardens,—R. H. Paterson,	30
Insecta Scotica—	
The Lepidoptera of Scotland,—F. Buchanan White, M.D., F.L.S.,	31
The Coleoptera of Scotland,—D. Sharp, M.B.,	35
Title page, Preface, and Index to Volume III.	

PERTH:
Perthshire Society of Natural Science.
Edinburgh: MacLachlan & Stewart, South Bridge.
London: E. W. Janson, 28 Museum Street, W.C.
Paris: E. Deyrolle, 23 Rue de la Monnaie.

NOTICE.

Subscribers who have not given notice of withdrawal, are requested to forward their subscriptions for 1877 (4s.) without delay. Unless paid at once, the higher rate and postage will be charged.

Subscriptions may be paid in the meantime to the Editor, or to Mr. John Young, C.E., Tay Street, Perth.

Subscriptions to the "Scottish Naturalist" 4s. per annum, post free, payable in advance. Single numbers, 1s. 2d. Annual Subscription not paid in advance, not including postage, 4s. 6d. Stamps cannot be received in payment, nor are receipts sent unless a Post Card or stamped Envelope is forwarded.

Communications intended for the April number must be sent not later than 1st March.

Price Fourpence per Month, or Four Shillings per Annum, post free.

THE NATURALIST:

Journal of the West Riding Consolidated Naturalists' Society,

AND

GENERAL FIELD CLUB RECORD.

NEW SERIES.

Edited by CHAS. P. HOBKIRK & GEO. T. PORRITT, F.L.S.

Containing Original Articles, Notes, Reports of Societies, Correspondence, Exchange, &c.

HUDDERSFIELD: B. BROWN.

NOTICE.

Subscribers who have not given notice of withdrawal, are requested to forward their subscriptions for 1877 (4s.) without delay. Unless paid at once, the higher rate and postage will be charged.

Subscriptions may be paid in the meantime to the Editor, or to Mr. John Young, C.E., Tay Street, Perth.

Subscriptions to the "Scottish Naturalist" 4s. per annum, post free, payable in advance. Single numbers, 1s. 2d. Annual Subscription not paid in advance, not including postage, 4s. 6d. Stamps cannot be received in payment, nor are receipts sent unless a Post Card or stamped Envelope is forwarded.

Communications intended for the April number must be sent not later than 1st March.

Price Fourpence per Month, or Four Shillings per Annum, post free.

THE NATURALIST:

Journal of the West Riding Consolidated Naturalists' Society,

AND

GENERAL FIELD CLUB RECORD.

NEW SERIES.

Edited by CHAS. P. HOBKIRK & GEO. T. PORRITT, F.L.S.

Containing Original Articles, Notes, Reports of Societies, Correspondence, Exchange, &c.

HUDDERSFIELD: B. BROWN.

THE QUARTERLY JOURNAL OF CONCHOLOGY.

This Journal circulates widely amongst Conchologists throughout the world, and contains every quarter articles dealing with all departments of the Science.

Price 1s. per number, or 4s. 4d. per Annum, Post-free.

Edited by JOHN W. TAYLOR, St. Ann's Printing Works, Leeds,

To whom all Post Office Orders should be made payable, and all communications addressed.

London: HARDWICKE & BOGUE, 192 Piccadilly.

REVUE ET MAGASIN DE ZOOLOGIE

PARAIT UNE LIVRAISON CHAQUE MOIS.

et forme chaque année un fort volume in 8vo. de 500 pages et 30 planches environ.

23 francs par an (£o 18s 6d, post free).

Ce recueil fondé en 1831 par M. Guerin Meneville est toujours sous la direction scientifique de ce celèbre auteur. Il contient un grand nombre de travaux inédits sur toutes les branches de la zoologie, et des comptes-rendus des ouvrages nouveaux ayant trait à cette science.

Les abonnements pour l' Angleterre doivent étre adréssé à Mr. Boucard, 55 Great Russell Street, W.C., London; pour les autres pays, chez Deyrolle fils, 23 rue de la Monnaie, Paris.

THE CANADIAN ENTOMOLOGIST:

A MONTHLY PUBLICATION ON INSECTS, ISSUED BY THE ENTOMOLOGICAL SOCIETY OF CANADA.

Subscription: Five Shillings stg. for volume of 12 numbers, free of postage.

Address—Rev. C. J. S. BETHUNE, Trinity College School, Port Hope, Ontario, Canada.

On the 1st of every month, Price Sixpence, 24 pp. 8vo.,

THE ENTOMOLOGIST'S MONTHLY MAGAZINE,

Conducted by J. W. DOUGLAS; R. M'LACHLAN, F.L.S., Sec. Ent. Soc.; E. C. RYE, and H. T. STAINTON, F.R.S., &c.

This Magazine was commenced in 1864, and its pages are principally devote to information respecting British Entomology.

London: JOHN VAN VOORST, 1 Paternoster Row, E.C.

N.B.—The volumes commence with the June number in each year. Subscriptions (0s per vol., post free), should be forwarded to the Editors, at the above address.

No. XXVI. APRIL, 1877. Vol. IV.

"Time's glory is
To unmask falsehood and bring truth to light."

THE SCOTTISH NATURALIST

Edited by F. Buchanan White, M.D., F.L.S.

CONTENTS.

	Page
Zoology—	
Porphyrio smaragdonotus Temm. in Scotland,—Col. DRUMMOND HAY, C.M.Z.S.,	37
Lepidoptera of Moncreiffe Hill,—Sir T. MONCREIFFE, Bart.,	38
A Supposed Undescribed Lepisma,—F. BUCHANAN WHITE, M.D., F.L.S.,	46
Note on the Kestrel,—W. C. M'INTOSH, M.D., F.R.S.E., F.L.S.,	46
Prevention of Extermination of Rare Birds,—J. A. HARVIE BROWN, F.Z.S.,	47
Has Melitæa Didyma occurred in Scotland?—EDITOR,	48
Fauna and Flora of Clydesdale (Review),	48
Proceedings of Nat. Hist. Soc. of Glasgow, Vol. III., Pt. 1 (Review),	58
Transactions of Glasgow Soc. of Field Naturalists, Pt. IV. (Review),	58
Phytology—	
Bryological Notes—Rev. J. FERGUSSON,	59
Structure of Common Mushroom *(illustrated)*,—W. G. SMITH, F.L.S.,	64
Contributions to the Desmid Flora of Perthshire,—J. ROY,	68
A Botanical Ramble in Glenshee,—Rev. J. FERGUSSON,	75
Notes on Cryptogams—On the Distribution of Buxbaumia aphylla in West of Scotland,—Professor R. H. PATERSON,	78
Exotic Fungi from Glasgow Botanic Gardens,—ID.,	78
Rare British Fungi,—ID.,	79
A New British Peziza,—F. BUCHANAN WHITE, M.D., F.L.S.,	79
Exidia repanda,—Rev. J. KEITH,	79
Insecta Scotica—	
The Coleoptera of Scotland,—D. SHARP, M.B.,	80

PERTH:
PERTHSHIRE SOCIETY OF NATURAL SCIENCE.
EDINBURGH: MACLACHLAN & STEWART, SOUTH BRIDGE.
LONDON: E. W. JANSON, 28 MUSEUM STREET, W.C.
PARIS: E. DEYROLLE, 23 RUE DE LA MONNAIE.

NOTICE.

Subscribers who have not given notice of withdrawal, are requested to forward their subscriptions for 1877 (4s.) without delay. Unless paid at once, the higher rate and postage will be charged.

Subscriptions may be paid in the meantime to the Editor, or to Mr. John Young, C.E., Tay Street, Perth.

Subscriptions to the "Scottish Naturalist" 4s. per annum, post free, payable in advance. Single numbers, 1s. 2d. Annual Subscription not paid in advance, not including postage, 4s. 6d. Stamps cannot be received in payment, nor are receipts sent unless a Post Card or stamped Envelope is forwarded.

Communications intended for the July number must be sent not later than 1st June.

SIXTH YEAR OF PUBLICATION

28, ESSEX STREET, STRAND, LONDON, December, 1876.

No. 18.

THE

NATURAL HISTORY AND SCIENTIFIC

BOOK CIRCULAR:

GENERAL NATURAL HISTORY.

WILLIAM WESLEY, BOOKSELLER AND PUBLISHER,

NATURAL HISTORY AND SCIENTIFIC BOOK AGENCY,

28, ESSEX STREET, STRAND, LONDON.

Agency of the Smithsonian Institution.

THE PRICES ARE NET, WITHOUT DISCOUNT, FOR READY MONEY. Orders from abroad should be accompanied with order for payment in LONDON. Post-office Orders payable at East Strand Office. In most cases, there are only Single Copies of the works; orders should therefore be sent without delay. If it is desired to see the books intended to be ordered, two days' notice is respectfully requested before calling. *Orders requested direct to WM. WESLEY, or the Books cannot be guaranteed or the Book Circular forwarded.*

Gentlemen having Works of a similar class to those in the Book Circular, and wishing to dispose of them, can have them inserted in the next number, free of expense, on reporting the titles and dates, and giving an accurate description of the size, binding, and condition of the Works, also stating the lowest price.

Orders for Works on Natural History and Science, whether in the Book Circular or not, are respectfully requested; W. Wesley has great facilities for obtaining works of this class.

GENERAL NATURAL HISTORY.

Abyssinie, Voyage en, 1839-43, par Lefebure, Petit, et Quartin-Dillon; ZOOLOGIE, par Des Murs-Prévost, Guichenot et Guérin Méneville, Texte, one volume 8vo, and royal folio atlas of 40 plates of Mammals, Birds, Insects, Reptiles, and Fishes, *half red morocco,* Paris, 1845, £5 5s.

Adams (A.) Travels of a Naturalist in Japan and Manchuria, frontispiece, 8vo, *cloth boards,* 1870, 8s 6d (pub. 15s.)

Adams (A. L.) Notes of a Naturalist in the Nile Valley and Malta, 25 plates and woodcuts, 8vo, *cloth.* 1870, 6s (pub. 15s.)

Adams, Baikie and Barron's Manual of Natural History for the Use of Travellers, being Descriptions of the Animal and Vegetable Kingdoms, small 8vo, *cloth boards,* 1854, 8s 6d (pub. 12s.)

Adams (A. L., Naturalist,) Field and Forest Rambles, with Notes on the Natural History of Eastern Canada, map and front. 8vo, *cloth boards,* 1873, 8s 6d (pub. 14s.)

Adams (H. G.) Humming Birds Described and Illustrated, *cloth,* 2s 6d.

——— Our Feathered Families, Illustrated, *cloth,* 2s 6d.

——— and **(H. B.)** The smaller British Birds, with Coloured Plates of Birds and Eggs, royal 8vo, new, *cloth,* 13s 6d.

— — Beautiful Butterflies, with coloured Plates, new, *cloth,* 3s 6d.

——— ,, Shells, with Coloured Plates, *cloth,* 2s 6d.

Agassiz (L.) Comparative Physiology, or the Structure and Development of Animals, Living and Extinct, edited by Wright, 380 woodcuts, foolscap 8vo, *cloth boards,* 1851, 4s 6d (pub 5s.)

Agassiz (L.) Etudes sur les Glaciers, 8vo, Text and folio Atlas of 32 Plates, 1840, 20s (pub. 40 frs.)

——— Untersuchungen über die Gletscher, 8vo, Text and folio Atlas of Plates, 1841, 10s (pub. 40 frs.)

Agassiz (L.) Histoire Naturelle des Poissons D'eau Douce de l'Europe centrale :—Livrn. I. Salmo and Thymallus, folio with 27 plates, 1839 (pub. 75 frs.) Livrn. II. Embriologie des Salmones, par Vogt, 1 volume royal 8vo and 14 plates in folio, 1842 (pub. 36 frs.) Livrn. II. bis. Anatomie des Salmones. folio, 11 plates (pub. 30 frs.) Together 52 remarkably fine plates, many of them elaborately coloured and heightened with silver, 1839-42, £3 10s. The same, printed on stout Vellum Paper, 52 plates, most of them elaborately coloured, 1839-42. £4 10s.

Agassiz (L.) Methods of Study in Natural History, small 8vo, *cloth boards,* Boston, U.S., 1863. 5s.

Agassiz (L.) Memoire sur les Moules de Mollusques vivants et fossiles ;—Ire. partie :—Les moules d'Acéphales vivants, 4to 12 plates, 1838, 8s. (pub. 12 frs.)

Agassiz (L.) Recherches sur les Poissons Fossiles, comprenant la description de 500 espèces qui n'existent plus, l'exposition des lois de la succession et du développement organique des poissons durant toutes les métamorphoses du globe terrestre, une nouvelle classification de ces animaux . . . enfin, des considérations géologiques générales tirées de l'étude des fossiles, 5 volumes, royal 4to of Text, and 18 livraisons, also one of "Dix planches de Squelettes" and one more of "Planches omises," containing in all 384 plates, many of them in tints, Neuchatel, aux frais de l'auteur, 1833-44, £20. (pub. 618 frs.)

Agassiz (L.) Structure of Animal Life; Six Lectures delivered at the Brooklyn Academy in January and February, 1862, 8vo, *cloth,* New York, 1866, 4s 6d.

GENERAL NATURAL HISTORY.

American The Angler's Book, embracing the Natural History of Sporting Fish and the Art of Taking them, with Instructions in Fly-fishing, Fly-making, and Rod-making, also Fish-breeding, with 80 woodcuts, thick royal 8vo, *cloth*, 8s 6d.

Andersson (C. J.) Lake Ngami; Exploration and Discoveries in the Wilds of South Western Africa, numerous illustrations, post 8vo, *cloth*, New York, 1856, 3s 6d.

Annals and Magazine of Natural History, including Zoology, Botany, and Geology, conducted by Jardine Johnstone, Babington, Gray, etc., a complete set, from the commencement in 1838 to May, 1873, with and entensive series of plates, in all 71 volumes, 8vo, 62 of them *half bound*, a neat uniform set, and 11 parts, 1838-73, £31 10s (pub. £60s.)

Annals of Natural History, or Magazine of Zoology, Botany, and Geology, by Jardine, Selby, Johnston, Hooker, Babington, Balfour, and Taylor, plates, 1st series, 20 volumes, 1838-47, and 2nd series, 1848, 2 volumes, together 22 volumes, 8vo, with numerous plates, 5 volumes in *boards*, 15 in *half calf*, neat, and 2 in parts, £5.

Annals of Natural History, or Magazine of Zoology, Botany, and Geology, three series, conducted by Sir W. Jardine, P. J. Selby, Dr. Johnston, Sir W. J. Hooker, R. Taylor, C. Babington, Dr. Gray, and Dr. Francis, from its commencement 1838 to end of 1867 inclusive, with upwards of 1000 coloured and other engravings, 61 volumes 8vo, *neatly half bound calf gilt*, 1838-67, £24 10s.

Ansted (Prof.) Scenery, Science, and Art, being extracts from the Note Book of a Geologist and Mining Engineer. 25 plates and woodcuts, 8vo, *cloth boards*, 1854. 5s (pub. 10s 6d.)

Arbeiten aus der Physiologischen anstalt zu Leipzig, vierter Jahrgang: 1869, mitgetheilt durch C. Ludwig. Mit vier Tafeln, 8vo, 1870, 2s.

Arago (J.) Narrative of a Voyage Round the World in the Uranie and Physicienne Corvettes, commanded by Captain Freycinet. 26 plates, 4to, *boards*, 1823, 6s.

Audubon (J. J. The Naturalist.) Life and Adventures by R. Buchanan, second edition, with portrait. 8vo, *cloth*, 1869, 7s 6d (pub. 15s.)

Babbage (C.) The Ninth Bridgewater Treatise. (Mosaic Account of the Creation, Desire of Immortality, Fate. Miracles, &c.) 8vo, *cloth*, scarce, 1837, 5s 6d.

Backhouse (J.) Narrative of a visit to the Mauritius and South Africa, 44 etchings and woodcuts, stout volume, 8vo, *cloth boards*, 1844. 7s (pub. 16s.)

Baily (William Hellier) Figures of British Characteristic British Fossils, with explanation of the Plates, and Descriptive remarks, with 42 Lithographic Plates, containing over 700 figures, and several woodcuts. Just published, demy 8vo. *cloth*, 15s (pub. £1 1s.)

Baird (S. F.) Mammals of North America: a full description based on the collections in the Smithsonian Museum. Illustrated with 87 plates of original Figures, a few coloured, royal 4to, *cloth*, Philadelphia, £3 10s.

Baird (Dr. W.) Student's Natural History, map and several hundred illustrations, thick 8vo, *cloth*, 1874, 8s 6d.

Bancroft (E.) Essay on the Natural History of Guiana in South America, frontispiece, small 8vo, *half calf*, 1769, 10s.

Barber's Picturesque Guide to the Isle of Wight, new edition, completed to the end of 1850, coloured map, with portrait of the Queen, vignette, and 43 beautiful and highly-finished engravings of scenery, accompanied by historical descriptions, including a coloured geological Map of the Island, by Dr. Mantell, 8vo, *newly half bound gilt, uncut*, 6s (pub. at 2 guineas.)

Bass Rock (The), its Civil and Ecclesiastical History, Geology, Martyrology, Zoology, and Botany, thick post 8vo, 1848, 5s 6d.

Bastian (H. C.) Modes of Origin of Lowest Organisms; Including a Discussion of the Experiments of M. Pasteur, and a reply to some Statements by Professors Huxley and Tyndall. Crown 8vo. *cloth*, 4s.

Bastian (H. C.) Beginnings of Life. Being some Account of the Nature, Modes of Origin, and Transformation of Lower Organisms. With upwards of 100 Illustrations. Two volumes. Crown 8vo, *cloth*, 28s.

Beale (Prof.) The Miscroscope in its Application to Practical Medicine, 58 plates, 8vo, *calf*, 1867, 12s 6d (pub. 14s.)

Beale (T.) Natural History of the Sperm Whale, with a Sketch of a South Sea Whaling Voyage, frontispiece, small 8vo, *half calf gilt*, 1839, 5s 6d (pub. 15s.)

Bechstein (J. M.) getreue Abbildungen aus der Naturgeschichte des In-und Auslandes, 8 volumes 8vo, 800 coloured plates of Mammals Birds, Fishes, and Reptiles, *boards*, £6.

Beechey.—Zoology of Capt. Beechey's Voyage to the Pacific and Behring's Straits, during the Years from 1825 to 1828, with 44 fine coloured engravings by Sowerby, 4to, *half morocco, gilt edges*, 1839, £4 (pub. £5 5s.)
Comprises Mammalia by Dr. Richardson, Ornithology by Vigors, Fishes by Lay and Bennett, Crustaces by Professor Owen, Reptiles by Gray, Mollusca by Sowerby, and Geology by Buckland.

Begbie (P. T.) Malayan Peninsula, its History, Manners, and Customs of the Inhabitants, Natural History, etc., 8vo, maps and plates, *half bound*, Madras, 1834, 28s.

Belcher (Sir E.) Narrative of the Voyage of H.M.S. Samarang, 1843-46, surveying the Islands of the Eastern Archipelago, with Notes on their Natural History and Vocabulary, map and numerous plates, 2 volumes, 8vo, *cloth*, 1848, 15s.

GENERAL NATURAL HISTORY.

Belcher (Sir E.) Last of the Arctic Voyages; the Expedition in Search of Sir J. Franklin in 1852-4, map and plates, some coloured, 2 large volumes, royal 8vo, *cloth*, 1855, 12s 6d (pub. 36s.)
The Notes on the Natural History are by Sir J. Richardson, Professor Owen, T. Bell, J. W. Salter, and L. Reeve.

Bell (T.) History of British Quadrupeds, including the Cetacea, with nearly 200 fine woodcuts, 8vo, *half calf*, scarce, 1837, £1 5s.

Bell (T.) History of British Reptiles, with 50 beautiful engravings on wood, imperial 8vo, largest paper, *cloth*, scarce, 1839, £1 12s.

Bell (T.) History of British Quadrupeds, including the Cetacea, by R. F. Tomes and E. R. Alston, with 160 illustrations, 8vo, 1874, 17s 6d.

Bellamy (J. C.) Natural History of South Devon, with many plates of fossils, antiquarian maps, &c, crown 8vo, 1839, 4s.

Belt (T.) The Naturalist in Nicaragua, with numerous illustrations and map, *half calf extra*, 8vo, 1874, 12s.

Beneden (P. J. van) Faune littorale de Belgique. Crustacés. gr. in-4. av. 21 plchs. Bruxelles (Acad.) 1861, 17s 6d.

——— Les Poissons des cotes de la Belgique, leurs parasites et leurs commensaux. 4. av. 8. plchs. col. et n. Brux. 1870, 14s 6d.

Beneden (Ed. van) recherches sur la composit. et la significat. de l'oeuf. Av 12 pl. 4. Brux., Acad., 1868. Br. 283 pp. Vergriffen, £1 7s 6d.

Bennett (Dr. G.) Gatherings of a Naturalist in Australia: being Observations on the Animal and Vegetable Productions in New South Wales and New Zealand, 8 fine coloured plates, etc. 24 woodcuts, 8vo, *cloth boards*, 1800, 12s 6d (pub. 21s.)

Bennett (G.) Wanderings of a Naturalist in New South Wales, Batavia, Singapore, China, etc, front, 2 volumes, 8vo, *half russia*, 1834. 11s 6d (pub. 30s.)

Bernstein (Julius) The Five Senses of Man, 91 woodcuts, crown 8vo, *cloth*, 1876, 5s.

Bewick (T.) General History of Quadrupeds, the figures engraved on wood by Thomas Bewick, fine original impression, second edition, 8vo, *calf gilt*, scarce, Newcastle, 1791, £1 10s.

Bewick (T.) General History of Quadrupeds, illustrated with several hundred woodcuts of Animals and vignettes by Thomas Bewick, 8vo, *calf neat*, scarce, 1792, 24s.

Bewick (T.) History of Quadrupeds, illustrated with several hundred beautifully engraved woodcuts of Animals, and choice vignettes, 8vo, *calf neat*, scarce, 1811, 21s.

Bewick (T.) General History of Quadrupeds, excellent impressions of the celebrated wood engravings, 8vo, *half calf*, neat, a few pages foxed, Newcastle, 1820, 17s.

Bewick (T.) General History of Quadrudeds; fine impressions of the numerous beautiful wood engravings, 8vo, *half calf*, *gilt*, tall clean copy, Newcastle, 1824, £1 7s 6d.

Birmingham Natural History and Microscopical Society. Address of the retiring President, Rev. G. Deane, 8vo, 1875, 1s.

Blandford (W. T.) Observations on the Geology and Zoology of Abyssinia, made during the progress of the British Expedition to that country in 1867-8, with coloured geological map, 6 coloured plates of Birds, and numerous other illustrations, thick 8vo, *cloth*, 1870, 14s (pub. 21s.)

Bloch (M. E.) Ichthyologie, ou histoire naturelle générale et particulière des Poissons, avec des figures enluminées, dessinées d'après nature, 12 parts in 6 volumes, large folio, coloured plates, *half calf*, uncut, Berlin, 1795-97, £25.

Blyth (E.) Catalogue of Mammals and Birds of Burma [edited by Anderson, Dobson, and Viscount Walden], 8vo, 170 pp., *sewed*, Hertford, 1875, 7s.

Boate (Gerard) Ireland's Naturall History; being a true and ample description of its situation, its Hills, Woods, Heaths, Bogs; of its Fruitful Parts; its Harbours, Roades, and Bayes, Springs and Fountains, Brooks, Rivers, Loghs, Metalls, Minerals, &c, and now published by Samuel Hartlib, small 8vo, *half calf*, antique, rare, 1652, 10s.

Boccius (G.) Fresh-water Fish; a treatise on their management, with a view to making them a source of profit to Landed Proprietors, 8vo, *half calf*, 1841, 8s.

Bonannii (P.) Rerum Naturalium Historia, nempe Quadrupedum Insectorum, Piscium, variorumque Marinorum Corporum Fossilium, Plantarum Exoticarum, ac præsertim Testaceorum exsistentium in Museo Kircheriano; nunc vero Nova Methodo distributa, Notis illustrata, etc, à J. A. Battarra, with 110 large plates, exhibiting several hundred figures, all carefully coloured, 2 large thick volumes, folio, a large paper copy, *half bound calf*, uncut, rare, Romæ, 1773-82, £2 2s.

Bosgoed (D. M.) Bibliotheca Ichthyologica et Piscatoria Catalogue de livres et d'Ecrits sur Histoire Naturelle des Poissons et des Cétacés, la Pisciculture, les Pêches, la Législation des Pêches, etc, redigé par D. Mulder Bosgoed, 8vo, *sewed*, 1874, 10s 6d.

Bosman (W.) New and Accurate Description of Guinea, its Natural History, Inhabitants, Customs, European Settlement, and Trade. 8vo, map and plates, *calf neat*, scarce, 1705, 6s 6d.

Bowden (Rev. J.) The Naturalist in Norway; or, Notes on the Wild Animals, Birds, Fishes, and Plants of that country, with some account of the principal Salmon Rivers, 8 coloured plates, crown 8vo, 7s (pub. 10s 6d.)

Brenchley (J. L.) Cruise of the Curacoa among the South Sea Islands. With observations on

GENERAL NATURAL HISTORY.

Natural History (Birds, 21 coloured plates, by J. R. Gray, Reptiles and Fishes by A. Günther 14 plates, Mollusca 7 coloured plates, Insects, 8 coloured plates,) many plates coloured and plain, 4to *cloth*, 1873, £2 12s 6d.

Bridgewater Treatises on the Power, Wisdom, and Goodness of God, as manifested in the Creation. A complete set of these highly valuable works, 12 volumes, 8vo, *light brown calf, gilt, marbled edges*, a very handsome set, Pickering, 1835, etc, £4 4s.

Brook (R.) A new and accurate System of Natural History, illustrated with several hundred woodcuts, 6 volumes, thick 12mo, *calf*, 1763, 6s.

Brooks (Henry) For many years a resident at Natal; a History and Description of the Colony, including its Natural Features, Productions, Industrial condition and prospects. Edited by Dr R. J. Mann, F.R.G.S., late superintendent of Education in the Colony. With maps, coloured plates, and photographic views, 8vo, *cloth*, 1876, 21s.

Brown (P.) Nouvelles Illustrations de Zoologie, descriptions D'Oiseaux Curieux, et qui non étés jamais descrits, et quelques de Quadrupèdes, de Reptiles et d'Insectes, 50 beautifully coloured plates, 4to, *boards*, 1776, 9s.

Brown (Capt. T.) Popular Natural History, or the Characteristics of Animals pourtrayed in a series of illustrative Anecdotes, with numerous coloured engravings, 3 volumes, foolscap 8vo, *cloth, gilt edges*, 10s 6d.

Brown (Capt. T.) The Zoologist's Textbook, embracing the Characters of the Classes, Orders, and Genera of almost the whole Animal Kingdom, together with an Example of a Species of each Genus, and a complete Glossary of Technical Terms, with 107 engravings, 2 volumes post 8vo, *cloth*, 1833, 5s 6d.

Brown (Rev. G. F.) Ice Caves of France and Switzerland, a Narrative of Exploration, 13 illustrations, small 8vo, *cloth boards*, 1865, 7s (pub. 12s 6d.)

Bruce (James) Travels to discover the Source of the Nile in the years 1768-73, 5 volumes, 4to, royal paper, *russia, neat*, 1790, £1 15s.

Buckland (F.) Curiosities of Natural History, the Four Series complete, numerous engravings, 4 volumes, 12mo, *cloth gilt*, 1874, 12s.

Buckland (F.) Fish Hatching, 3s.

——— Log Book of a Fisherman and Zoologist, 6s (pub. 12s.

Buckley (Arabella B.) A short History of Natural Science and of the Progress of Discovery from the time of the Greeks to the present day. With Illustrations, post 8vo, *cloth*, pp 486, 1876, 9s.

Buffon, Histoire Naturelle, nouvelle edition, Revue et Corrigée Par M. Lacepede, Imprimée sur Beau Papier, avec environ 700 estampes gravées par Pauquet, the complete set, 76 volumes, 18mo, *bound in cloth, edges uncut*, Paris, 1799-1802, 40s.

Buffon, Les Œuvres Completes, mises en ordre et precédes d'une Notice par M. A. Richard, suivie de 2 volumes par M. Cuvier sur les Progrés des Science Physique et Naturelle, 32 volumes bound in 16, 8vo, *calf extra, marbled leaves*, illustrated with 200 artistically coloured plates, Delangle, Paris, 1828, £5 15s 6d (pub. £29.)

Buffon. Natural History of the Earth, Man, Birds, Fish, Insects, &c., translated with Notes by Barr, nearly 300 neatly engraved plates, 15 volumes, small 8vo, *calf*, a neat set, 1797-98, 12s 6d.

Buffon. Natural History, general and particular, translated by W. Smellie, new edition corrected and considerably enlarged by W. Wood, F.L.S., illustrated by upwards of 600 engravings, 20 volumes, 8vo, *calf neat*, 1812 £3 3s.

Burchell (W. J.) Travels in the Interior of Southern Africa, illustrated with 20 fine coloured plates and 96 woodcuts, 2 volumes, 4to, *boards*, 1822-24, 30s (pub. £9 9s.)

Burmeister (Herm.) Systematische Uebersicht der Thiere Brasiliens (Mammalia, Aves), 8vo, 3 volumes, *cloth*, Berlin, 1854-56, 15s.

Calcutta Journal of Natural History: Botanical Papers, by Griffith, extracted from the above, etc., in one volume, 8vo, plates, *half calf*, 1838, 25s.

Calcutta Journal of Natural History, containing the progressive discoveries in Indian Geology, Zoology, Botany, &c., edited by M'Clelland and Griffith, numerous engravings, complete from the commencement, 6 volumes, 8vo, *half russia*, very scarce, Calcutta, 1840-46, £4 4s. plates. Unpublished, 4to, Calcutta, 1844, 14s 6d.

Cantor (T. H.) Zoology of the Island of Chusan (East Coast of China) 32 pages with 12 coloured plates, 4to, 1844, 14s 6d.

Carpenter (Dr. W. B.) Introduction to the Study of the Foraminifera, 22 fine large plates, small folio, *half calf*, very neat, Ray Society, 1862, £2 2s, very scarce.

Carpenter's Treatise on the Microscope and its Revelations, illustrated with nearly five hundred plates, last much enlarged edition, thick volume. post 8vo, *cloth*, 1875, 12s 6d.

Carpenter (Dr.) Zoology, a Systematic account of the Structure, Habits, Instincts, and Uses of the principal Families of the Animal Kingdom, several hundred exquisitely finished plates, 2 volumes, post 8vo, no titles, *half green morocco*, 1848, 9s.

Cassell's Illustrated Natural History, with about 2,000 fine wood engravings, besides coloured plates, 4 volumes in 2, thick imperial 8vo, *half morocco, gilt, marbled edges*, 1873, 30s (pub. £2 2s in cloth.)

GENERAL NATURAL HISTORY.

Cassell's Illustrated Popular Natural History, numerous coloured plates, and about 2,000 engravings, embracing mammalia, birds, reptiles, fish, &c., 4 volumes imperial 8vo, *extra cloth, gilt edges*, 28s 6d (pub. 42s.)

Catlin (G.) North American Indians; Illustrations of their Manners, Customs, and Condition, written during Eight Years of Travel and Adventure amongst 48 of the Wildest and most remarkable Tribes now existing, with 360 curious engravings from the author's original paintings, 2 large volumes, imperial 8vo, *half calf neat*, 1841, £1 5s.

Catlin (G.) Life amongst the Indians, a Book for Youth, 14 illustrations, thick 12mo, *cloth boards*, scarce, 1861 4s 6d (pub. 6s.)

Catlow (Agnes) Drops of Water, their Marvellous and Beautiful Inhabitants displayed by the Microscope, coloured engravings, square 8vo, *cloth*, 1851, 6s 6d.

Chalmers (Rev. Thos.) Power, Wisdom, and Goodness of God, as manifested in the Adaptation of External Nature to the Moral and Intellectual Constitution of Man, 2 volumes, 8vo, *calf gilt*, 1835, 7s 6d.

Church (J.) Cabinet of Quadrupeds, with Historical and Scientific Descriptions, 84 beautiful engravings by Ibbetson, Scott, Tookey, &c, proof impressions, 2 volumes, folio, large paper, *neatly half bound*, 1805, £1 16s.

Coleman (W. S) Our Woodlands, Heaths, and Hedges, A popular Description of Trees, Shrubs, Wild Fruits, etc, and their Insect Inhabitants, numerous engravings, 12mo, *green morocco, tooled sidese, gilt leaves*, 5s.

Collingwood (C.) Rambles of a Naturalist on the Shores and Waters of the China Sea, 10 illustrations, 8vo, *cloth boards*, 1868, 10s (pub. 16s.)

Contributions to Natural History, chiefly in relation to the Food of the People, by a Rural D.D., crown 8vo, *cloth*, 1865, 3s 6d.
Comprising Hippopagy, or Should we Eat our Horses?—Should we Eat Funguses?—Salmon, and how to increase it.

Dalton (E. T.) Descriptive Ethnology of Bengal, illustrated by frontispiece and 37 Lithograph Potraits of individuals of native tribes; copied from Photographs, *cloth*, Calcutta, 1872, £3 10s.

Dalyell (Sir J.) The Powers of the Creator displayed in the Creation, or Observations on Life amidst Various Forms, with 116 plates, containing many thousand accurately coloured figures, from living Objects, 2 volumes, 4to. *boards*, Van Voorst, 1851, £3 10s (pub. £6 6s.)

Dalyell (Sir J. G.) Rare and Remarkable Animals of Scotland, with Observations on their Nature, 109 large plates, containing several thousand accurately coloured figures from living Objects, 2 volumes, 4to, *boards*, Van Voorst, 1847-8, £3 3s (pub. £6 6s.)

Darwin (C.) Descent of Man, and Selection in Relation to Sex, 2 volumes, post 8vo, 1871, *cloth*, 17s 6d (pub. 24s.)

Darwin (C.) The Expressions of the Emotions in Man and Animals, post 8vo, with Photographic and other illustrations, 1872, *cloth*, 9s (pub. 12s.)

Darwin (C.) Journal of Researches into the Geology and Natural History of the various Countries, visited by H.M.S. Beagle, from 1832 to 1836, map, thick 8vo, *half calf*, scarce, 1839, £1 1s.

Darwin (C.) Natural History and Geology of the Countries Visited during a Voyage Round the World, crown 8vo, *cloth*, 1875, 6s 6d.

Darwin (C.) Origin of Species by Means of Natural Selection, or the Preservation of favoured Races in the struggle for Life, small 8vo, *cloth boards*, 1866, 9s 6d (pub 14s.)

Darwin (C.) Variation of Animals and Plants under Domestication. Revised edition, 14th thousand, with Illustrations, 2 volumes, crown 8vo, *cloth*, 18s.

Edwards (M. Milne) Manual of Zoology, edited by R. Knox, 500 woodcuts, 12mo, 1856, 5s 6d (pub. 8s 6d.)

Emory (W. H.) Report on the United States and Mexican Boundary Survey, by W. H. Emory, U. S. Commissioner, profusely illustrated by fine engravings of scenery, coloured plates of various native tribes, plants, &c. 3 large think volumes, royal 4to, *half calf*, Washington, 1857-9, £2.
Volume 2 is devoted to the Botany and Zoology of the Boundary, illustrated by many hundred plates, engraved in a highly finished style, particularly the cactaceæ (76 plates); the 25 plates of Birds are beautifully coloured. The writers of the descriptions are Drs. Parry, Torrey, Englemann, Girard, and S. F. Baird.

Engineering, An Illustrated Weekly Journal, conducted by Zerah Colburn, Maw, and Dredge, complete from the commencement in January, 1866, to the end of 1874, volumes i to xviii, atlas, 4to, many large folding plates and woodcuts, 17 volumes, *half morocco*, the last in parts, 1866-74, £15 15s.

Fergusson, Tree and Serpent Worship; or Illustrations of Mythology and Art in India, in the first and fourth centuries after Christ, from Sculptures of the Buddhist Topes at Sanchi and Amravati, super-royal 4to, original edition, 250 pp, 100 photographs and plates, *half red morocco, gilt top*, uncut, 1868, £5 5s.

Figuier (L.) Birds and Reptiles, 307 Plates, 8vo, 11s.

——— World before Deluge. New edition, crown 8vo, 5s 6d.

——— Insect World. New Edition, 7s.

GENERAL NATURAL HISTORY.

Figuier (L.) Vegetable World. New Edition, 5s 6d.
——— Ocean World. New Edition, 5s 6d.
——— Reptiles and Birds. New Edition, 5s 6d.
——— Primitive Man, 233 Plates, 8vo, 10s 6d.
——— Mammalia: their Various Orders and Habits, 267 Plates, *cloth*, 8vo, 10s (pub. 16s.)
——— The Human Race. New Edition, 7s.
——— Mammalia. New Edition, 7s.

Fitzinger (J. J.) Naturgeschichte der Säugethiere in ihren sämmtlichen Hauptformen 2. Ausgab. 6 Theile. gr. 8. Wien, 1863, 15s 6d (pub. 33s.)
——— Naturgeschichte der Vögel. gr. 8. 1292 bg. Band I. II. soviel erschienen, Wien 1862-63, 10s.

Flint (Austin) The Physiology of Man designed to represent the existing state of Physiological Science as applied to the Functions of the Human Body, 8vo, *cloth*, New York, 1867, 7s 6d.

Flower (W. H.) An Introduction to the Osteology of the Mammalia, with numerous Illustrations, *cloth*, 7s.

Fluckiger and **Hanbury**. Pharmacograhphia. A History of the Principal Drugs of Vegetable Origin found in Commerce in Great Britain and British India. By F. A. Flückiger and D. Hanbury, F.R.S., 8vo, 17s 6d.

Forbes (Major) Eleven Years in Ceylon, Sketches of the Field Sports, Natural History of the Colony, etc., engravings, 2 volumes 8vo., 1841, *cloth uncut*, 8s.

Forbes (Prof. J. D.) Norway and its Glaciers, with excursions in the High Alps of Dauphiné, Berne, and Savoy, 2 maps, 10 tinted lithographs, and 22 woodcuts, royal 8vo, *cloth boards*, 1853, 21s, scarce.

Forbes (J.) Oriental Memoirs, 4 volumes, portrait and numerous plates, those of Natural History finely coloured, *red morocco super extra, borders and central ornaments worked in gold, gilt edges*, by J. Mackenzie, 4to, 1813, £10 10s.

Forbes (James, F.R.S.) Oriental Memoirs, a narrative of 17 years in India, 2 volumes, 8vo, *cloth boards*, and a 4to atlas of 82 plates, the Natural History portion finely coloured, 1835, 25s, (£5 15s 6d).

Fortune (R.) Residence among the Chinese: Inland, on the Coast, and at Sea. Engravings, 8vo, *cloth*, 1857, 5s.

Fortune (R.) Wanderings in the Northern Provinces of China, including the Tea, Silk, and Cotton Countries, 18 illustrations, 8vo, *cloth boards*, 1847, 8s 6d (pub. 14s).

Gardiner (W.) The Music of Nature, an attempt to prove that that which is pleasing in Music and Singing is derived from the sounds of the animated world, large 8vo, *cloth*, 1840, 11s 6d.

Garner (R.) Natural History of the County of Stafford, comprising its Geology, Zoology, Botany, and Meteorology; also its Antiquities, Topography, and Manufactures, with coloured geological map and numerous engravings on steel and wood, 8vo, *cloth*, 1844, 12s 6d.

Geikie (J.) The Great Ice Age, and its relation to the Antiquity of Man, with numerous illustrations and maps, thick 8vo, *cloth*, 1874, £1, scarce.

Glasgow Natural History Society proceedings of:
Volume I, part I, 228 pp., 3 plates, 8vo, 1859-68, price 4s 6d.
Volume I, part II, 156 pp., 4 plates, 8vo, 1868-69, price 4s.
Volume II, part I, 164 pp., 1 plate 8vo, 1869-71, price 3s 6d.
Volume II, part II, 192 pp., 3 plates 8vo, 1871-75, price 4s 6d.

Good (G. B.) Bulletin of the United States National Museum. Classification of the Collection to illustrate the animal resources of the United States, a list of substances derived from the Animal Kingdom, with synopsis of the useful and injurious animals, and a classification of the methods of capture and utilization. 8vo, *sewed*, pp. 126, Washington, 1876, 5s.

Gosse (P. H.) Handbook to the Marine Aquarium, with frontispiece, post 8vo, *cloth*, 1855, 2s.

Gosse (P. H.) History of the British Sea Anemones and Corals, illustrated by 12 finely coloured plates, complete, 8vo, *sewed*, 1860, 14s, scarce (pub. 21s.)

Gosse (P. H.) Introduction to Zoology, illustrated with numerous beautiful woodcuts by Whimper and others, 2 volumes, post 8vo, *calf gilt*, 1844, 15s.

Gosse (P. H.) Letters from Alabama, United States, chiefly relating to natural history, post 8vo, *cloth*, 1859, 3s.

——— Naturalists' Sojourn in Jamaica, coloured plates, small 8vo, *cloth*, 1851, 12s 6d, scarce.

——— Tenby, a Seaside Holiday, coloured plates, small 8vo, *cloth*, 1856, 12s 6d (pub £1 1s.)

Gosse (P. H.) Text-book of Zoology, with numerous plates, post 8vo, *boards*, 1851, 5s.

Gosse (P. H.) A year at the shore, with 36 coloured plates, thick volume, crown 8vo, *cloth*, 1873, 7s 6d (pub. 12s.)

Grant (C.) History of Mauritius, or the Isle of France, and the neighbouring islands, composed principally from the papers of Baron Grant, by his son, Charles Grant, Viscount de Vaux, large maps, 4to, *boards*, 1801, 12s 6d.

Graves (George, F.L.S.) The Naturalists' Pocket Book, or Tourist's Companion: being a brief Introduction to the different branches of Natnral History, with approved methods for

GENERAL NATURAL HISTORY.

collecting and preserving the various productions of Nature, 5 coloured and 3 plain plates, containing upwards of 124 figures, 8vo, *boards*, 1817, 5s (pub. £1 1s), very scarce.

Gray (J. E.) Gleanings from the Menagerie and Aviary at Knowsley Hall: Hoofed Quadrupeds, edited by J. E. Gray, imperial folio, 62 fine plates, fifteen of them superbly coloured, from drawings by W. Hawkins, Knowsley, 1850.

Gray (J. E.) Gleanings from the Menagerie and Aviary at Knowsley Hall, edited by J. E. Gray, imperial folio, 17 beautifully coloured plates from the series of drawings made by Mr. E. Lear, Knowsley, 1846.

——— together 2 volumes imperial folio, 79 large plates, 32 of them coloured, *cloth*, very rare, 1846-50, £12 12s.

——— the same, 2 volumes imperial folio, a picked presentation copy, with 70 coloured plates, *cloth*, 1846-50, £16 16s.

Griffith (J. W.) and Henfrey (A.) Micrographic Dictionary, a Guide to the Examination, Structure, and Nature of Microscopic Objects, illustrated with 45 plates (some of them coloured) and 816 woodcuts, 2 volumes, 8vo, *half morocco*, 1856, 28s (pub. £2 5s).

——— Second Edition, with 45 coloured plates and 812 woodcuts, 2 volumes, 8vo, *half calf neat*, 1860, 34s (pub. £2 5s).

Hall (Capt.) Life with the Esquimaux, with a Description of their mode of Life, 100 illustrations, 2 volumes, 8vo, *cloth boards*, 1864, 12s 6d (pub. 24s.)

Hamilton's Northern Coast of the County of Antrim, with observations on the Antiquities, Manners, and Customs of that county, and a natural history of the Basaltes, port, map, and plates, 12mo, *half bound*, Belfast, 1822, 3s.

Hancock (T.) Essay on Instinct and its Physical and Moral Relations, 8vo, *half calf*, 1824, 4s.

Harris (G.) Nature and Constitution of Man, 2 volumes, 8vo, *cloth*, 1876, 28s.

Harris (Capt. W. C.) The Wild Sports of Southern Africa, with lithographic illustrations, post 8vo, *cloth*, 1839, 4s 6d.

Harris (Sir W.) The Highlands of Æthiopia described, during Eighteen Months' Residence of a British Embassy at the Christian Court of Shoa, large map, etc, 3 volumes, 8vo, *cloth*, 1844, 8s 6d (pub. £2 2s).

Hartwig (Dr. G.) The Sea and its Living Wonders, a popular accocnt of the Marvels of the Deep, illustrated with 12 chromoxylographic plates, and numerous woodcuts, third edition, enlarged, 8vo, *cloth*, 1866, 10s 6d.

Hassall (A. H.) Food and its Adulterations: Records of the Results of some Thousands of Original Microscopical and Chemical Analyses of the Solids and Fluids consumed by all Classes of the Public, with 159 woodcuts, thick 8vo, *cloth*, 1855, 18s (pub. 28s.)

Hassall (A. H.) Adulterations Detected; or Plain Instructions for the Discovery of Frauds in Food and Medicine, 225 woodcuts, small 8vo, *cloth boards*, scarce, 1857, 12s 6d (pub. 17s 6d.)

Hassall (Dr. A. H.) Microscopic Anatomy of the Human Body in Health and Disease, coloured plates, 2 volumes 8vo, *half calf*, 1849, £1 12s 6d (pub. £2 5s cloth.)

Hassell (J.) Picturesque Rides and Walks, with Excursions by water, thirty miles round London, illustrated in a series of 120 engravings coloured after nature, with historical and Topographical Descriptions, 2 volumes, 12mo, *calf gilt, very neat*, 1817-18, 12s 6d (pub. £3 3s).

Henslow (Rev. G.) Evolution of Living Things, 4s (pub. 6s).

Herbert (H. W.) Frank Forester's Field Sports in the United States and British America, 2 volumes, small 8vo, *cloth boards*, 1848, 6s 6d (pub. 21s.)

Hoeven (J. Van der) Handbuch der Zoologie, 2 volumes, 8vo, *half calf*, Leipzig, 1850, 20s.

Hooker (J. D.) Himalayan Journals; or Notes of a Naturalist in Bengal, the Sikkim, and Nepal Himalayas, the Khasia Mountains, &c., numerous tinted plates and woodcuts, 2 volumes, 8vo, *cloth*, scarce, 1854, £1 4s (pub. 36s.)

Horsfield (T. W.) History and Antiquities of Lewes and its Vicinity, with an appendix containing an Essay on the Natural History of the district, by G. Mantell, numerous maps and plates, 4to, *boards, uncut*, 1824, 16s 6d.

Howitt (M.) Birds and Flowers, 16mo, *cloth*, 5s.

Hughes (Rev. G.) Natural History of Barbadoes, numerous plates, folio, *calf*, 1750, 12s 6d, scarce.

Humbley (Capt. W. W. W.) Journal of a Cavalry Officer; including the memorable Sikh Campaign of 1845-46, maps, thick volume, 8vo, *cloth*, 1854, 5s (pub. £1 1s.)

Humboldt, Personal Narrative of Travels to the Equinoctial Regions of the New Continent, translated by Williams, maps and plans, 7 volumes 8vo in 6, *new half calf gilt*, 1822, £3 10s.

Humboldt, Works translated by Black and Williams, with numerous maps and engravings, 14 volumes, 8vo, *half calf extra, newly bound*, 1818, £4 7s 6d.

Humphry (G. M.) Observations in Myology, including Cryptobranch, Lepidosiren, Dog-fish, etc, plates, 8vo, *cloth*, 1872, 4s 6d.

Humphrey (Noel) River Gardens, an account of the best method of cultivating Fresh Water Plants, numerous engravings, square post 8vo, *cloth*, 1857, 3s.

Huyshe (Capt. G. L.) The Red River Expedition, with maps, crown 8vo, *cloth*, 6s.

Intellectual Observer and Student's Review of Natural History, Microscopic Research and

GENERAL NATURAL HISTORY.

Recreative Science,—a complete set of both series, illustrated with numerous coloured plates and woodcuts, 17 volumes, royal 8vo, *half cloth, boards*, 1862-70, £3 3s (pub. £7 10s.)

Intellectual Observer, a Review of Natural History, Microscopic Research, and Recreative Science, a complete set, illustrated with many hundred coloured plates and woodcuts, 12 volumes, 8vo. *extra cloth boards, marbled leaves*, 1862-68, £2 12s 6d (pub. £4 10s.)

International Scientific Series, comprising Professor Tyndall's Forms of Water—Bagehot's Physics and Politics—Dr. Smith on Foods—Bain on Mind and Body—Spencer's Socio ogy —Dr. Stewart on Conservation of Energy—Pettigrew's Animal Locomotion—Dr. Maudsley on Mental Disease—Cook's New Chemistry—Amos' Science of Law—Marcy's Animal Mechanism—Schmidt's Decent and Darwinism—Draper's Religion and Science—Cooke and Berkeley on Fungi —Dr. Vogel on Light, and Professor Whitney on Language, 16 volumes, small 8vo, *cloth boards*, 1872-75, £3 3s (pub. £3 18s.)

Jacquin (N. J.) Miscellanea Austriaca ad Botanitam Chemicam et Historiam Naturalem Spectantia, 44 coloured plates of Flowers, Fungi, Fuci, Insects, &c., 2 volumes in 1, small 4to, *old red morocco extra*, 1778-81, 17s 6d.

Jardine (Sir W.) Naturalist's Library, a complete set, 40 volumes, 12mo, portraits, vignettes, and upwards of 1320 coloured plates, *half calf neat*, contents lettered, an original copy, Edinburgh 1833-43, £10.

Jardine (Sir W.) Naturalist's Library, a complete set, illustrated with 1200 coloured plates of Animals, Birds, Insects, and Fishes, 40 volumes, foolscap, 8vo, *extra cloth boards, top edge gilt*, 1850, £5 15s 6d (pub. £12.)

Jardine (Sir W.) Selby and Johnston's Magazine of Zoology and Botany, numerous plates on steel and wood, some coloured, 2 volumes 8vo, *cloth*, 1837, 8s 6d.

Jesse (E.) Gleanings in Natural History. 3 volumes crown 8vo, *boards*, 1835, 10s 6d.

Jesse (G. R.) History of the British Dog, from ancient laws, charters, and historical records. With Original Anecdotes and Illustrations of the Nature and Attributes of the Dog, from the Poets and Prose Writers of Ancient, Mediæval and Modern times. 2 Library volumes, 8vo, with 33 engravings designed and etched by the Author, *cloth gilt*, 16s (pub. 32s).

Jesse (E.) Anecdotes of Dogs, illustrated with 20 fine steel plates, drawn and engraved by W. R. Smith, small 4to, *cloth boards*, 1846, 10s 6d (pub. 21s.)

Jewitt (Llewellyn) Grave Mounds and their contents, a Manual of Archæology, as exemplified in the burials of the Celtic, the Romano-British, and the Anglo-Saxon Periods, with nearly 500 illustrations, crown 8vo, *cloth, gilt edges*, 1870, 10s.

Jones (Prof. T. Rymer) Animal Creation, a Popular Introduction to Zoology, illustrated with 488 woodcuts, small 8vo, *cloth boards*, 1868, 6s. 6d.

Jones (Prof. T. Rymer) General Outline of the Animal Kingdom and Manual of Comparative Anatomy, 336 woodcuts, 8vo, *half morocco*, 1841, 14s 6d (pub. 35s.)

Jones (Prof. T. Rymer) Natural History of Animals, illustrated with 209 woodcuts, 2 volumes, small 8vo, *cloth boards*, 1845-52, 12s 6d (pub. 24s.)

Jukes (J. B., Naturalist to the Expedition) Narrative of the Surveying Voyage of H.M.S. Fly in Torres Strait, New Guinea, &c., during the years 1842-46, numerous plates, 2 volumes, 8vo, *half calf*, 1847, 16s, scarce.

Jukes (J. B.) Narrative of the Surveying Voyage of H.M.S. Fly in the Eastern Archipelago. Text, perfect, many plates and the map deficient, 2 volumes, 8vo, *boards*, 1847, 9s (pub. 30s.)

King (Major W. Ross) Sportsman and Naturalist in Canada; or Notes on the Natural History of the Game, Game Birds, and Fish of that Country, by Major W. Ross King, illustrated by 6 coloured plates and 13 engravings on wood, imperial 8vo, *new cloth gilt*, 1836, 12s (pub. £1.)

Knapp. The Journal of a Naturalist, 2 plates, small 8vo, *cloth*, 1850, 2s.

Knight (C.) English Encyclopædia, conducted by Charles Knight.—Biography, 6 volumes; Natural History, with the Supplement, 5 volumes; Arts and Sciences, 8 volumes; Geography, 5 volumes; Synoptical Index, 1 volume. Together 25 volumes, 4to, *new cloth*, with upwards of 6000 illustrations, last edition, £10 10s.

Kidder (J. H.) Contributions to the Natural History of Kerguelen Island made in connection with the United States Transit of Venus Expedition, 1874-75, 8vo, pp. 122, Washington 1876, *sewed*, 5s.

Knight's Pictoral Museum of Animated Nature, 4000 woodcuts of Animals and Birds of every kind, with full and complete descriptions, 2 volumes folio in 1, *half morocco*, 1850 £1 7s 6d.

Knorr, Muller, et Walch, Deliciæ Naturæ Selectæ, oder auserlesenes Naturaliencabinet, welches aus den drey Reichen der Natur zeiget was von Liebhabern aufbehalten und gesammlet zu werden verdienet, with 91 large and very finely coloured plates of Mammals, Birds, Shells, Crabs, Amphibia, Fossils, Minerals, etc., 2 volumes royal folio, *half-bound calf neat*, Nürnberg, 1778, £1 12s.

Koren u. Danielssen, Fauna littoralis Norvegiae. II. Beschreib. neuer Echinodermen, Polypen, Mollusken etc. d. Norweg. Küste. fol. m. 12 Kpfrtfln. cart. Bergen, 1856, £1 6s 6d.

Lahore to Yarkand. Incidents of the Route and Natural History of the Countries traversed by the expedition of 1870, under T. D. Forsyth, Esq., C.B.; by George Henderson, M.D.,

GENERAL NATURAL HISTORY.

F.L.S., F.R.G.S. ; and Allan O. Hume, Esq., C.B., F.Z.S. With 32 coloured plates of Birds, 6 of Plants, 26 Photographic Views, Map, and Geological Sections, £1 16s.

Land (The) we live in; a Pictorial, Historical, and Literary Sketch Book of the British Islands, with descriptions of their more remarkable features and localities, 4 volumes 4to bound in 2, with maps and steel engravings, *half morocco*, 27s 6d.

Lanier (Sidney) Florida: its Scenery, Climate, and History, with an account of Charleston, Savannah, Augusta, and Aiken ; a chapter for Consumptives and various papers on Fruit Culture, &c. Being a complete handbook and guide. illustrated 12mo, *cloth*, pp. 336, Philadelphia, 9s.

Lankester (E. R.) Half-hours with the Microscope, illustrated by 250 Drawings from Nature by Tuffen West. New edition, much enlarged, with full description of the various parts of the Instrument, a chapter on the Polariscope, and Coloured Frontispiece. Coloured illustrations, foolscap 8vo, 4s.

Lankester (E. R.) Comparative Longevity in Man and the Lower Animals, crown 8vo, *cloth*, 4s 6d.

Landt (Rev. G.) Description of the Faroe Islands, containing an account of their Situation, Climate, and Productions, with the Manners and Customs of the Inhabitants, map and plates, 8vo, *boards*, 1810, 6s.

Lavater (L.) Essays on Physiognomy, designed to promote the Knowledge and the Love of Mankind, translated by Dr. H. Hunter, complete edition, with several hundred beautiful engravings by Holloways, Bartolozzi, W. Blake, and others, 3 large volumes, imperial 4to, *half bound calf*, 1810, £8 10s.

Lawrence (Sir W.) Lectures on Physiology, Zoology, and Natural History of Man, with 12 plates, 8vo, *half calf, neat*, scarce, 1819, 9s.

Lees (Edwin, F.L.S.) Pictures of Nature in the Silurian Region round the Malvern Hills and Vale of Severn, 8vo, *cloth*, new, 1856, 3s.

Linnæi (Car.) Philosophia Botanica in qua explicantur Fundamenta Botanica, original edition, 8vo, *calf*, Stockholmiæ 1751, 12s.

Linnæi, Systema Naturæ, editio decima, reformata, 2 volumes, 8vo, *calf*, Holmiæ, 1758-59, 10s.

Linne, Systema Naturæ per regna tria naturæ, cura J. F. Gmelin, 3 volumes in 10, 8vo, *half calf, uncut*, Lugduni, 1789-96, 12s.

Linnean Society, Transactions of the second series:—Zoology, volume I, part III, 1876, 4to, pp. 83-154, 11 coloured plates, price £1 8s.
Contents—On 31 species of Marine Planarians collected by Dr. Kelaart and Dr. Collingwood in the Eastern Seas, by Dr. Collingwood. On the structure and development of the Bird's Skull by W. K. Parker, F.R.S. (Part II.)

Livingstone (Dr.) First Expedition to Africa, 1840-1856, illustrated, *half calf extra*, 11s.

——— Second Expedition to Africa, 1858-1865, illustrated, *half calf extra*, 11s.

———The Last Journals of, from 1865 to his death, 2 volumes, *half calf extra*, 21s.

Lloyd (H.) Field Sports of the North ; comprised in a personal Narrative of a Residence in Sweden and Norway, by L. Lloyd, with map and spirited illustrations, 2 volumes, 8vo, *cloth*, 1830, 15s.

Lloyd (L.) Scandinavian Adventures, with an account of the Northern Fauna, illustrated with 12 lithographic plates, and 102 woodcuts, 2 volumes, royal 8vo, *half calf neat*, 1854, 22s (pub. £2 2s.)

London and Edinburgh Philosophical Magazine and Journal of Science, conducted by Brewster, Taylor, and Phillips, from 1838 to December 1850, plates, 25 volumes, 8vo, *half russia*, 1838-50, £3 10s.

Loudon (J. C.) and Charlesworth's Magazine of Natural History, and Journal of Zoology, Botany, Mineralogy, Geology, and Meteorology, several hundred plates, 13 volumes, 8vo, *half calf gilt*, 1829-40. £3 3s.

Loudon (Mrs.) Entertaining Naturalist, being popular descriptions, Tales, and Anecdotes of more than 500 Animals, revised and enlarged by Dallas, several hundred engravings, thick post 8vo, *cloth*, 6s.

Low (Rev. G.) Fauna Orcadensis, or the Quadrupeds, Birds, Reptiles, and Fishes of Orkney and Shetland, edited by W. Leach, 4to, *boards*, Edinburgh 1813. 9s.

Lowe (R. T.) Fishes of Madeira, a history of, with 27 original coloured figures from nature of all the species by the Hon. C. Norton and M. Young, royal 8vo, *new half morocco, top edges gilt*, £1 4s.—The same, large paper, 4to, *new half morocco*, 1843-60, £2 10s.

Lubbock (Sir J.) Origin of Civilization and the Primitive Condition of Man.—Mental and Social Condition of Savages, 20 illustrations, 8vo, *cloth boards*, 1870, 12s 6d (pub. 16s.)

Lubbock (Sir J.) Pre-Historic Times, as illustrated by Ancient Remains and the Manners and Customs of Modern Savages, 8vo, numerous plates, *cloth*, 1865, 12s.

Macalister (A.) Introduction to Animal Morphology and Systematic Zoology. Part I, Invertebrata, 8vo., 1876, 10s 6d.

Macgillivray (Dr.) Natural History of Dee-side and Braemar, 14 illustrations, stout volume, 8vo, handsomely bound, *red morocco extra, richly tooled back and sides, gilt leaves*, a beautiful copy, very rare, £6 6s.

GENERAL NATURAL HISTORY.

McIntosh. Monograph of the British Annelids, 23 coloured and plain plates, 2 volumes, folio, *boards*, 1873-4, £2 5s.

Maclaren (James, M.A.,) Barrister-at-law, a Critical Examination of some of the principal arguments for and against Darwinism, 1876, 9s.

Mantell (G. A.) Invisible World revealed by the Microscope; or thoughts on Animalcules, 12 beautifully coloured plates, square 12mo, 1850, 5s.

Martin (G. A.) 'Undercliff' of the Isle of Wight, its Climate, History, and Natural Productions, folding frontispiece, crown 8vo, *cloth*, 1849, 4s (pub. 10s 6d.)

Martin (W. C.) A General Introduction to the Mammiferous Animals, with a particular view of the Physical History of Man and the more closely allied Genera of the Order, upwards of 300 engravings by W. Harvey, 8vo, *cloth*, 1841, 10s.

Martyn (W. F.) Dictionary of Natural History, with coloured plates, depicting about 600 examples, coloured, 2 volumes in 1, folio, *calf*, 1785, 13s.

Mason (F.) Burmah, its people and natural productions, 8vo, *cloth*, Rangoon, 1860, 18s.

Maton (Dr.) The Natural History of a part of the County of Wilts within Ten Miles of Salisbury, 8vo, 1843, 2s.

Maunder (S.) Treasury of Geography, Physical, Historical, Descriptive, and Political, edited by W. Hughes, with 7 maps and 16 plates, fool-cap 8vo, *cloth*, 5s 6d.

Medico and Chirurgical Transactions, a complete set, from the commencement in 1809 to 1874 (the last volume published) with a General Index to the first 53 volumes, and a Catalogue of the Library, many plates, some of them finely coloured, 60 volumes 8vo, 23 of them *neatly bound half calf*, the others in *boards and cloth*, 1815-74, £6 15s (pub. £50.)

Melliss (I. C., F.S.S.) St. Helena, a Physical, Historical, and Topographical Description of the Island, its Geology, Fauna, Flora, and Meteorology, 56 plates and maps, mostly coloured, super royal 8vo, *cloth boards*, 1875, 28s (pub. at £2 2s.)

Menetries (E.) Catalogue Raisonne des Objets de Zoologie receullis dans un Voyage au Caucase et jusqu' aux Frontiéres Actuelles de la Perse, 2 coloured plates of Insects, 4to, *sewed*, 1832, 7s 6d.

Meredith (L.) My Home in Tasmania, during a Residence of Nine Years, with illustrations, 2 volumes post 8vo, *new half calf gilt*, 1852, 10s 6d.

Microscopical Journal (the Monthly) and Transactions of the Microscopical Society, complete from the commencement in 1869 to Dec. 1875, being numbers 1-84, or volumes I-XIV, 8vo, many plates, in parts, 1869-75, £4 10s (pub. at £6 6s.)

Microscopical Society's Quarterly Journal, from its commencement, 1856, to Oct., 1868, 16 volumes, 8vo; also the Microscopic Monthly Journal, from Jan. 1869, to Dec. 1874, edited by Dr. Lawson, 12 volumes, illustrated with plates, in all 28 volumes, 8vo, in parts, 1856-74, £13 13s.

Mikan (J. C.) Delectus Floræ et Faunæ Brasiliensis, royal folio, 24 plates, coloured in a superior manner, *half morocco, uncut*, Vindobonæ, A. Strauss, 1820-25, £4 (pub. £7 16s.)

Mivart (St. George, F.R.S.) Lessons from Nature as Manifested in Mind and Matter, 8vo, *cloth*, 15s.

Monro (A.) Structure and Physiology of Fishes, explained and compared with those of Man and other Animals, plates, folio, *half bound*, Edinburgh, 1785, 8s.

Morgan (Lewis) Systems of Consanguinity and Affinity of the Human Family, thick royal 4to, genealogical tables and diagrams, *boards*, Washington, 1871, £3 3s.

Morsey (Edward S.) First Book of Zoology, post 8vo, *cloth*, 1876, 5s.

Muller (J.) (Argentin.) Euphorbiaceae (revisae et in ordinem system. dispositae.) 2 partes. 8. —S. A. a. d. Linnaea, 1863-65, 8s (pub. 15s.)

Muller (O. Fr.) Vermium terrestrium et fluvatilium seu Infusoriorum, Helminthorum et Testaceorum non marin. hist. 2 voll. (3 partes). 4. Havniae 1773-74, 12s (pub. 15s 6d.)

——— Naturgeschichte einiger Wurm-Arten des süssen und salzigen Wassers. 4. m. 16 Kpfrtfln. Kopenhagen, 1772, 7s 6d.

——— Zoologia Danica, s. animalium Daniae et Norwegiae rar. ac minus notorum descriptio et historia. 4 voll. fol. cum 160 tabulis aëneis, Havniae 1788-1806, £3 17s 6d (pub. £6.)

——— Zoologia Danica. 4 voll. cum 160 tabulis coloratis, £6 12s 6d (pub. £11 12s).

Murray (Andrew) Geographical Distribution of Mammals, comprising Origin of Species, Modes of Dispersal, Distribution of Man, the Rank and Priority of Black and White Races, Feline Species, Ruminants, Cetacea, Singular Origin of Insectivora, Characteristic Forms in Africa, Europe, &c., with numerous illustrative maps and plates, 4to, *cloth*, 1866, 28s (pub. £3 3s.)

Museum of Natural History: being a popular account of the Structure, Habits, and Classification of the various Departments of the Animal Kingdom—Quadrupeds, Birds, Reptiles, Fishes, Shells, and Insects, by Sir J. Richardson, W. S. Dallas, and others, numerous plates (many beautifully coloured) and woodcuts; 4 volumes, royal 8vo, *cloth, gilt leaves*, 1863, 27s (pub. £3 3s.)

Natural History Review, including the Transactions of the Belfast, Cork, Dublin, and Kilkenny, Scientific Societies, conducted by Dr. Harvey, Professor Haughton, etc., a complete set, from 1854 to Oct. 1865, plates and woodcuts, 12 volumes, 8vo, *very neatly half bound calf*, 1854-65, £4 15s (cost £8.)

Naturalist (The) a Magazine illustrative of the Animal, Vegetable, and Mineral Kingdoms,

GENERAL NATURAL HISTORY.

conducted by Beverley R. Morris, Rev. F. O. Morris, and C. R. Bree, with plates, 8 volumes, 8vo, (3 *half bound*, 5 *cloth*) 1851-58, £1 10s.

Natural History Review, and Journal of Zoology, Botany, Geology, and Palæontology, from the commencement in 1853 to 1860, with many engravings, 7 volumes, 8vo, *half calf neat*, 1854-60, £3 10s.

Natuurkundige Vereeniging in Nederlandsch Indie: Tijdschrift voor Nederlandsche Indië, volumes I-IX, 8vo, maps and plates, *uncut*, Batavia, 1850, £10.

Nott and Gliddon's Types of Mankind, or Ethnological Researches based upon Ancient Monuments, &c., 10th edition, illustrated, thick royal 8vo, *cloth*, £1 4s.

Nott and Gliddon's Indigenous Races of the Earth, numerous plates and diagrams, thick royal 8vo, *cloth*, £1 4s.

Owen (C.) Serpents, Natural History, with plates, 4to, *calf*, 1742, 5s 6d.

Owen (Prof. Richard) Lectures on the Comparative Anatomy and Physiology of the Invertebrate Animals, with numerous woodcuts, 8vo, *half calf*, 1843, 5s. 6d.

Owen (R.) Memoir on the Pearly Nautilus, with Illustrations of its external form and internal structure, 15 plates, 4to, *cloth*, 1832, 12s 6d.

Owen (Prof. R.) Odontography; or a Treatise on the Comparative Anatomy of the Teeth, their Physiological Relation, Mode of Development, and Microscopic Structure, in the Vertebrate Animals, with 168 fine engravings, 2 thick volumes royal 8vo, *half russia*, 1840-45, £2 2s.

Owen (Richard) On the Classification and Geographical Distribution of the Mammalia, etc., 8vo, *cloth*, 5s.

Packard (A. S., junr.) Life Histories of Animals, including Man; or outlines of comparative Embryology, with 268 wood engravings and plate, 243 pp., 8vo, *cloth*, New York, 1876, 12s 6d.

Parnell (Dr. R.) Natural History of all the Fishes of the Firth of Forth and Tributaries plates, 8vo, *cloth*, 1838, 9s.

Parry (Captain) Journals of Three Voyages for the Discovery of a North-West Passage, map and frontispieces, 5 volumes, 18mo, *cloth boards*, 6s 6d (pub. 20s).

Pennant (T.) British Zoology, plates, best edition, 4 volumes, 1812—Tours in Wales, plates, 3 volumes, 1810—Journey from Chester to London, plates, 1811—and some Account of London, map and plates, 1813, together 9 volumes, royal 8vo, all large paper, *uniform in calf, very neat*, 45s.

Pennant (T.) History of Quadrupeds, with upwards of 100 full-page engravings, 3rd edition, 2 volumes, small 4to, *calf gilt*, fine copy, 1793, 10s.

Pennant (T.) Tours in Scotland in 1769 and 1772, and Voyage to the Hebrides, maps, and numerous fine engraved plates of scenery, antiquities, natural history, &c., by Mozell, 3 volumes, 4to, *half calf*, 1790, £2 17s 6d.

Pennant (T.) Works on Natural History and Topography, 18 volumes in 4to and 8 royal 4to, together 26 volumes, containing nearly 800 plates, *uniformly bound in brown calf*, £12.—Contents of this set: Literary Life, by himself, portrait, 1793—British Zoology, 4 volumes (volume I, pp. 35-36 defective), Warrington, 1776—Arctic Zoology, with Introduction, 2 volumes, 1785—Indian Zoology and Faunula Indica, 1790—Genera of Birds, 1781—Quadrupeds, 2 volumes, 1781—Journey from Chester to London, 1782—Account of London, large paper, plates inserted, 1790—Tour in Scotland, 3 volumes, 1774—Tour in Wales and Journey to Snowdon, 2 volumes, with the supplemented plates by M. Griffith, 1778-83—History of Whiteford and Holywell, 1796—Tour to the Isle of Wight, 2 volumes, 1801—Tour from Downing to Alston Moor, 1801—View of Hindoostan, the Malayan Islands, New Holland, &c.—1798-1800.

Pember (G. H.) Earth's Earliest Ages, including a Treatise on Spiritualism, post 8vo, *cloth*, 1876, 6s.

Penny Magazine of the Society for the Diffusion of Useful Knowledge, numerous illustrations, both series, 14 volumes, small folio, *new half cloth*, 1832-45, 24s.

Perry (Com.) Narrative of an American Expedition to the China Seas and Japan, with the Scientific part on the Zodiacal Light, illustrated with 132 printed lithographic plates of costumes, landscape scenes, &c., those on Natural History finely coloured, and woodcuts, 3 volumes, 4to, *cloth boards*, 1856, 30s (pub. £6 6s).

Pettigrew (J. B.) The Physiology of the Circulation in Plants, in the Lower Animals, and in Man. With 150 illustrations, 8vo, *cloth*, 11s.

Pickering (Charles, M.D.) Geographical Distribution of Animals and Plants, part II, Plants in their Wild state, imperial 4to, pp. 524, with 4 double-page Maps, Salem (Mass.) 52s 6d.

Popular Science Review; a Quarterly Miscellany of Entertaining and Instructive Articles on Scientific Subjects, edited by J. Samuelson, from its commencement in 1862 to 1871 inclusive, illustrated by numerous woodcuts and plates, some coloured, 10 volumes, 8vo, *cloth*, 1862-71, £2 12s.

Portlock (Capt. N.) Voyage Round the World and to the North-west Coast of America, 20 maps and plates, royal 4to, *calf gilt extra, marbled leaves*, a fine copy, 1789, large paper, 13s 6d.

Plinii Historia Naturalis, Interpretatione et Notis illustravit Harduinus, map and 11 plates of Ancient Coins, 3 volumes folio, *French calf gilt*, Paris 1723, 16s.

Potter (T. R.) History and Antiquity of Charnwood Forest, with an Appendix on the Geology, Botany, and Ornithology of the district, 4to, *cloth*, illustrated, 1842, 13s 6d.

GENERAL NATURAL HISTORY.

Prichard (J. C.) Natural History of Man, comprising Inquiries into the Modifying Influence of Physical and Moral Agencies on the Human Family, 4th edition, enlarged by E. Norris, with 62 coloured plates and 100 fine woodcuts, 2 volumes, royal 8vo, *new cloth*, 1855, £1 10s.

Prichard (J. C.) Researches into the Physical History of Mankind, coloured plates, 2 volumes, 8vo, *boards*, 1826, 10s (pub. £2).

Prichard (J. C.) Natural History of Man, comprising enquiries into the influence of Physical and Moral Agencies on the Human Race, with 55 beautifully coloured portraits of the various races of mankind, and nearly 100 fine woodcuts, best edition, thick imperial 8vo, *calf gilt*, 1843, £1 1s.

——— Six Ethnological Maps, Supplement to the Natural History of Man, and to the Researches into the Physical History of Mankind, coloured, and 1 sheet of letterpress, folio, *boards*, 1843, 13s 6d (sells at £1 1s).

Raffles (Sir T. S.) History of Java, 2 volumes, 8vo, *half calf gilt, marbled leaves*, 1830, 10s 6d (pub. 28s).

Ralph (T. S.) Icones Carpologicæ, or Figures of Seeds, 4to, numerous plates, *boards*, 1849, 5s 6d.

Ramon de la Sagra, Historia fisica, politica y natural de la isla de Cuba, 13 volumes, fol' av. plus de 250 plchs. color. et n. cart. Madrid 1849-61, £30 10s 6d (pub. £45).

Ray (John) Travels through the Low Countries, Germany, Italy, and France, with Francis Willoughby's Travels in Spain, with Catalogues of Plants, 2 volumes, 8vo, plates, 1738, 4s 6d.

Ray Society Publications.—A complete set, including the volume published in 1874, consisting of works by Eminent Naturalists, viz.—Alder and Hancock, Darwin, Carpenter, Günther, Bowerbank, Baird, Forbes, Allman, Ray, Agassiz, Huxley, Leighton, Brown, Blackwell, Masters, etc., etc.. illustrated by an extensive series of plates, many of them finely coloured, 24 volumes, folio, and 27 volumes in 8vo, *cloth boards*, in all 51 volumes, 1845-74, £36 (pub. £50), scarce.

Ray (John) Select Remains, with his Life and Itineraries by W. Derham, 8vo, portrait, *calf*, 1760, 3s.

Ray (John) Catalogus Plantarum circa Cantabrigiam, cum Index Plant. Agri Cantab. 2 volumes in 1, 12mo, *half bound*, Cantab., 1660, 3s.

——— Methodus Plantarum Nova, 12mo, frontispiece, *bound*, 1682, 2s.

Rennie (J.) Field Naturalist, Animals, Plants, Minerals, Earth, and Sky; coloured plates and illustrations, Jan. 1833 to April 1834, 8vo, *half calf gilt*, 7s 6d.

Ridge (B., M.D.) Principles of Organic Life, 2nd edition, crown 8vo, 1876, 10s 6d.

Richardson's Fauna Boreali-Americana, or Zoology of the Northern parts of British America; Quadrupeds, with fine plates by Landseer, 1829; Fishes, with plates, some finely coloured, 1836, together 2 volumes 4to, *calf gilt* and *cloth*, 1829-36, £2 12s 6d.

Rodwell (G. F., F.R.A.S., F.C.S.) A Dictionary of Science, comprising Astronomy, Chemistry, Dynamics, Electricity, Heat, Hydrodynamics, Hydrostatics, Light, Magnetism, Mechanics, Meteorology, Pneumatics, Sound, and Statics; preceded by an Essay on the History of the Physical Sciences, pp. xxviii and 580, 8vo, *cloth*, 1871, 12s (pub. 18s).

Ross (Sir J. C.) Voyage of Discovery and Research in the Southern and Antarctic Regions in 1839-43, with 34 plates and maps, 2 volumes, 8vo, *cloth boards*, 1847, 21s (pub. 36s) very scarce.

Ross (Sir J.) Narrative of a Second Voyage in Search of a North-West Passage, 30 charts and fine steel plates, 4to, *cloth boards*, 1835, 9s 6d (pub. £2 2s).

Rougemont (Ph. de) Etude de la Faune des Eaux privées de Lumière. (Histoire Naturelle du Gammarus puteanus. Description de l'Asellus Sieboldii Rougem. Description anatomique de l'Hydrobia de Münich.) 4. mit 5 Kupfertafeln. Neuchâtel 1876, 7s 6d.

Royen (Adrian van) Ericetum Africanum s. icones Ericearum Africae. 40 tabulae aëneae hucusque ineditae, 4. Berolini. 13s 6d.

Royal Institution of Great Britain, proceedings at the Meetings, with an Abstract of the Discourses from the Commencement in 1851 to 1872, containing Papers by Professors Owen, Phillips, Faraday, Tyndall, &c., &c., 6 volumes, 8vo, 3 of them in *cloth boards*, the others in parts, 1851-72, 30s (pub. £3 3s).

Ruppell (E.) Neue Wirbelthiere zu der Fauna von Abyssinien gehörig, entdeckt und beschrieben von Dr. Ed. Rüppell, folio, fine coloured plates, *half red morocco, top edge gilt*, fine copy, Frankf. am Main, 1835-40, £4 4s.

Russell (Dr. Alex.) Natural History of Aleppo and parts adjacent. 4to, plates, *calf gilt*, 1856, should be 1756, 7s 6d.

Sars, Koren et Danielssen, Fauna littoralis Norvegiae; Beschr. u. Abbild. neuer od. wenig bekannter Seethiere. (Polypi, Holothur., Asterid., Mollusca.) 2 partes. fol. m. 22 Kpfrt. cart. Christiania u. Bergen 1846-56, £4 12s.

Sars (G. O.) Cumaceae novae. Beskriv. af de paa Fregatten Josephine's Expedition fundne Cumaceer. gr. 4. m. 20 Kpfrt. Stockh. 1871, 13s 6d.

——— On some remarkable forms of animal life from the great deeps of the Norwegian coast. I. Polyzoa, Annelida, Spongiae. roy. 4. w. 6 plates, Christiania 1872, 11s 6d.

——— The same. II. Researches on the structure and affinity of the genus Brisinga, roy. 4. with 7 copperplates. Christ. 1875, 13s 6d.

Scherzer (Dr. Karl) Narrative of the Circum-navigation of the Globe by the Austrian Frigate Novara (Commodore, B. Von Wullerstort-Urbair), undertaken by order of the Imperial Govern-

ment, in the years 1857-58-59, under the auspices of His Imperial and Royal Highness the Arch duke Ferdinand Maximilian. English Translation, 3 handsome volumes, 8vo, with map and numerous illustrations. 1861-3, 24s.

Schinz (H. R.) Beschreib. u. Abbild. d. künstl. Nester u. Eier d. Vögel, welshe in. d. Schweiz, in Deutschl. u. d. angrenz. Ländern brüten. 4. m. 74 color. Kpfrt, Hfz. Zürich, 1819-20, £4.

——— Naturgesch. u. Abbild. d. Vögelgattgn. fol. m. 144 Kpfrt. Hfz. Zürich 1830, 23s (pub. £3.)

——— Europ. Fauna. 2 Bde. 8. Stuttg. 1840, 5s 6d.

——— Naturgesch. d. Vögel. 2, vermehrte Ausg. fol. m. 126 color. Kpfrt. Zürich 1851, £2 15s (pub. £6 6s).

Schlagintweit (H. A. and R. de) Results of a Scientific Mission to India and High Asia, 1854-58, Text, 4 volumes, royal 4to, with double imperial folio Atlas of geographical and physical maps, views and panoramas, and meteorological plates, most of them coloured—together 4 volumes *cloth*, and a portfolio, Leipzig. 1861-66, £10.

Schlegel et Pollen, Rech. s. les Mammifères et l. Oiseaux de Madagascar, av. 40 plchs color. Leyde 1868, £2 15s.

Schlegel (H.) Abhandlungen aus dem Gebiete der Zoologie und vergleichenden Anatomie, 3 parts in 1 volume, 4to, with 15 coloured plates of Fishes (Dolphins) and Birds, *half morocco*, Leiden 1841-51. 21s.

Schlegel (H.) Essay on the Physiognomy of Serpents, translated by Prof. Traill, map and plates, post 8vo, *cloth* Edin. 1843, 5s.

Schoolcraft (O.) Indian Tribes of the United States ; their History, Condition, and Prospects, illustrated by about 300 engravings. coloured plates and woodcuts, representing the Antiquities, Manners, Customs, &c., of the Indians, 5 large volumes imperial 8vo, *new cloth*, 1853, £3 3s (pub. £8.)

Schweinfurth (Dr.) The heart of Africa, Three Years' Travels and Adventures in the Unexplored Regions of Central Africa, 1868-71, translated by Ellen E. Frewer. maps and numerous wood cuts, 2 thick volumes, 8vo, *cloth*, clean as new, 1874, 22s 6d (pub. £2 2s.)

Science Lectures, Manchester, by Professors Huxley, Tyndall, Roscoe, Ward, Balfour, Stewart, Drs. Carpenter, Gladstone, Huggins, Cobbold. J. Norman Lockyer, Sir John Lubbock, and others, 3 volumes, post 8vo, *crimson cloth*. 1866-75, 7s. 6d.

Scrope (G. P.) Volcanoes, the character of their Phenomena, and their share in the Structure and Composition in the Surface of the Globe, map, plate, and woodcuts, 8vo, *cloth boards*, 1862, 12s 6d (pub. 15s) scarce.

Scrope (J. C.) Considerations on Volcanos, the probable causes of Phenomena, the laws which determine their march, &c., 8vo, *half calf*, 1825, 7s 6d.

Seemann (Berthold) Narrative of the Voyage of H.M.S. Herald during the years 1845 51, under the command of Captain Henry Kellett, R.N., C.B., being a Circumnavigation of the Globe, and Three Cruises to the Arctic Regions in search of Sir John Franklin, map and plates, 2 volumes. 8vo, *cloth*, 1853, 10s 6d.

Shaw (G.) Cimelia Physica, Figures of Rare and Curious Quadrupeds, Birds, &c., together with several of the most elegant Plants, engraved and coloured from the subjects themselves, by J. S. Miller, with descriptions by G. Shaw, 50 coloured plates, imperial folio, *half bound*, 1796, 25s.

Shaw (Dr. G.) General Zoology, or Systematic Natural History, with the Continuation by Stephens, and General Index, with 1200 finely engraved plates of Quadrupeds. Birds, Fishes, Amphibia. Insects, &c., by Heath, 28 volumes, 8vo, *calf gilt*, a nice uniform set of this valuable and interesting work, 1800-26, £4 4s.

Siebald (Sir Robert, MD.), Scotia Illustrata, sive Prodromus Historia Naturalis. Folio, with 22 plates including the portrait of Alex. Boyd, *calf neat*, scarce, Edinburgh, 1864, 21s.

Siebold (Ph. Fr.) Fauna Japonica, sive descriptio animalium, qua in itinere per Japoniam suscepto, annis 1823-1830 collegit, notis, observationibus et adumbrationibus illustravit Ph. Fr. de Siebold conjunctis studiis C. J. Schlegel atque W. de Haan e'aborata. Contents : Mammalia, 1 volume, imperial 4to, 30 coloured plates, 1850. £2 (pub. £3 12s.) Aves, 1 volume imperial 4to, 120 coloured plates, very rare, 1850, £16 16s. Reptilia, 1 volume, imperial 4to, with 30 plates, *boards*, 1838, £1 10s (pub. £3.) Pisces, 1 volume, imperial 4to, with 160 plain plates, very rare, 1842, £10, or coloured plates, £20. Crustacea. 1 volume, imperial 4to, with 70 plates. 1850 £3 3s. The text to the Crustacea is in Latin, that of the other classes of Animals in French. ———The set complete, 5 volumes, folio, the plates of the Mammals, Birds, and Fishes coloured, *boards*, Lugduni Batavorum, 1838-50. £45.

Simpson (Sir G., Governor of the Hudson's Bay Company) Narrative of a Journey Round the World in 1842. portrait and map, 2 volumes, 8vo, *cloth boards*, 1847, 10s 6d (pub. 31s 6d.)

Simpson (Captain J. H.) Report of Explorations across the Great Basin of the Territory of Utah. Contents : Introduction to Report and Journal, 138 pp. Appendixes A. B. and C.—Itenerari-s of Wagon-Routes, pp. 149-156.—Appendix D.—Astronomical Observations and Geographical Positions, pp. 157-166. Appendix E.—Barometrical and Meteorological Observation and computation of altitude, by Henry Engelmann, pp. 167-208. Appendix F.—

GENERAL NATURAL HISTORY.

Table of Distances, Altitudes and Grades.—pp. 209 to 214 with folding table. Appendix G.—Estimate of appropriations needed for Roads in Terr. of Utah, pp. 215 to 220. Appendix H.—Magnetic Observations and Results, pp. 224 to 230, with map. Appendix H. H.—Railroad-Routes from the Atlantic to the Pacific Ocean, pp. 231 to 242. Appendix J.—Report of the Country between Fort Leavenworth and Sierra Nevada, near Carston Valley, by Henry Engelmann, pp. 243 to 335. Appendix J.—Report on the Palæontological Collections of the Expedition, by T. B. Meek, pp. 337 to 374, with five large plates of Fossils. Appendix K.—Ornithology, by Professor Spencer, F. Baird. pp. 375 to 382. Icthyology, by Professor Theo. Gill, pp. 383 to 432: with nine fine plates af Fishes. Appendix M.—Botany of the Expedition by George Engelmann, pp. 433 to 448, with three beautiful plates. Appendix N.—Population and Resources of the Terr. of Utah, by Dr. Garland Hunt, pp. 449 to 456. Appendix O.—Indians of Utah, by Dr. Garland Hunt, pp. 457 to 464. Appendix P.—Report on the languages of the different tribes of Indians in the Terr. of Utah, by Lieut. C. K. Collins, pp. 465 to 474. Appendix Q.—Journal of Edward M. Kern, of an Exploration of Mary's on Humboldt River, Carson Lake and Owen's River and Lake . in 1845, pp. 475 to 486. Appendix R.—Journeyings of Father Escalante from Santa Fé to Utah Lake and the Moqui Villages, in 1776, by Philip Harny, pp. 487 to 495, with map, also a large folding map of Utah territory and index, one thick volume, large 4to. *new extra cloth*, 518 pp., Washington, 1876, £3 3s.

Simpson (W.) Meeting the Sun; a journey all round the World, through Egypt, China, Japan, and California, with Heliotypes and woodcuts, 8vo, *cloth*, 24s.

Simson (James) Contributions to Natural History, and papers on other subjects, 8vo pp, 186, Edinburgh, 1876, 6s.

Smith (Andrew) Zoology of South Africa, consisting of Descriptions and Figures of the Objects of National History, collected during an expedition into the Interior of South Africa, 5 volumes, royal quarto, illustrated with several hundred plates, coloured to life, *cloth*, 1849, £10 10s (pub £25.)

Smith (A.) Illustrations of the Zoology of South Africa, No. 1, 4to, sewed, with full-page coloured plates, 1838, 7s.

Smith (E.) Foods, 4th Edition, post 8vo, 1876, 5s.

Southall (J. C.) Recent Origin of Man, as illustrated by Geology and the Modern Science of Pre-historic Archæology, with illustrations, thick 8vo, *new cloth*, Philadelphia, 1875. 12s.

Sowerby (J.) British Miscellany, or Coloured Figures of New, Rare, or Little Known Animal Subjects, 76 finely coloured plates of Birds, Insects, Zoophytes, etc., *half morocco*, uncut, 1804-66, £2 2s (pub. at £3 3s.)

Sowerby (J.) Tortoises, Terrapins, and Turtles, a Series of Sixty beautifully coloured Plates, drawn from life by James de Carle Sowerby, F.L.S., and lithographed by Edward Lear, with short Descriptive Notices by Dr. J. E. Gray, imperial 4to, *half morocco, gilt top*, 1872, £4 10s.

Stephenson (Dr.) Medical Zoology and Mineralogy; including an Account of animal and mineral poisons, 45 plates, containing several hundred finely coloured figures, royal 8vo, *half calf*, 1832, 15s.

Strasburger (E.) La Formation et la Division des cellules. Traduite par J. J. Kick, 8 folding plates, royal 8vo, 1876, 20s.

Swainson (Rev. C.) Hand Book of Weather Folk-Lore, being a collection of Proverbial Sayings in various languages relating to the Weather, post 8vo, *half morocco*, 1873, 5s 6d (pub. at 7s 6d.

Tandon (Moquin) World of the Sea, Translated from the French of Moquin Tandon, by the Rev. H. M. Hart, with 18 Coloured and Tinted Plates, and numerous Wood Engravings. *half calf extra*, 22s.

Taylor (J. E.) Notes on Collecting and Preserving Natural History Objects, 12mo, *cloth*, 3s.

Taylor (J. E.) Half-Hours in the Green Lanes, small 8vo, nearly 300 cuts, *cloth*, 4s.

Taylor (J. E.) Half-Hours at the Seaside, or recreations with Marine Objects, small 8vo, with about 150 Illustrations. Second edition, coloured illustrations, 6s.

Temminck, Monographies de Mammalogie, ou Description de quelques Genres de Mammifères, dont les Espèces ont été observées dans les différens Musées de l'Europe, with 70 Osteological plates, many folding, 2 volumes, royal 4to, *mottled calf, French style*, Paris et Lieden, 1827-41. £2 2s.

Tennent (Sir J. E.) Sketches of the Natural History of Ceylon, with Narratives and Anecdotes illustrative of the Habits and Instincts of the Mammalia, Birds. Reptiles, Fishes, and Insects, including a Monograph of the Elephant, and a description of the modes of capturing and training it, with engravings from original drawings by Sir J. E. Tennent, thick volume, crown 8vo, *cloth*, 1861, 9s 6d.

Tournefort.—Voyage into the Levant, containing the Ancient and Modern States of the Islands of the Archipeligo Constantinople, &c., several hundred plates of Antiquities, Natural History, &c., 2 volumes, 4to, *half rough, calf* 1718, 6s 6d.

Tugwell (Rev. G.) Manual of the Sea-Anemones, commonly found on the English Coast, 7 beautifully coloured plates, small 8vo, *cloth*, 1856, 3s 6d.

United States, Geological and Geographical Survey of the Territories. I. A Notice of the Ancient remains of Southwestern Colorado, examined during the summer of 1875, by W.

GENERAL NATURAL HISTORY.

H. Holmes. II. A notice of the Ancient Ruins in Arizona and Utah, lying about the Rio San Juan, by W. H. Jackson. III. The Human Remains, found near the Ancient Ruins of Southwestern Colorado and New Mexico, by Dr. Emil Bessels, with 29 plates, including 7 of human skulls, pp. 63, 8vo, *sewed*, Washington, 1876, 5s.

Van Der Hoeven (Prof.) Hand Book of Zoology, translated by Dr. W. Clark, 24 plates, 2 stout volumes, 8vo, *cloth boards*, 1856-58, 34s (pub. £3.)

Van Benedin (P. J.) Animal Parasites and Messmates, 83 Illustrations, post 8vo, pp 300, *cloth*, 1876, 5s.

Vasey (George) A Monograph of the Genus Bos.—The Natural History of Bulls, Bisons, and Buffaloes, exhibiting all the known Species (with an Introduction containing an Account of Experiments on Rumination from the French of M. Flourens), 8vo, with 72 engravings on wood by the author, *cloth*, 5s (original price 10s 6d.)

Voyage en Scandinavie, en Laponie, au Spitzberg et aux Feroés pend. l. a. 1838-40, publ. s. la dir. de P. Gaimard. 16 volumes de texte in-8. gr. in-fol. renf. 446 plchs. en partie color. Paris 1840-56. £18 5s (pub. £43.)

Wallace (A. R.) Contributions to the Theory of Natural Selection, small 8vo, *cloth boards*, 1876, 8s 6d.

Wallace (A. R.) Malay Archipelago; the Land of the Orang-Utan and the Bird of Paradise; a Narrative of Travel, with Studies of Man and Nature; numerous illustrations, 2 volumes, small 8vo, *cloth*, 1869, 15s.

Wallace (Alfred R.) Geographical Distribution of Animals, with a Study of the Relations of living and extinct Fauna, as elucidating the past changes of the Earth surface, with maps and illustrations, 2 volumes, 8vo, pp. 1,126, *cloth*, 1867, 42s.

Walton (Elijah) The Camel, its Anatomy, Proportions, and Paces, royal folio, 94 fine large plates, some coloured, showing the entire frame of the animal in its various parts, postures and powers, *cloth, gilt edges*, 1865, £2 12s 6d (pub. at £4 4s.)

Waterhouse (G. R.) Natural History of Mammalia, with 44 engravings, many beautifully coloured, and numerous woodcuts of Marsupiata and Rodentia, 2 thick volumes, royal 8vo, *cloth*, Bailliere, 1846-8, £1 10s (pub. £3 9s.)

Watford. Natural History Society and Hertfordshire Field Club, volumes I, part 4, pp. 89-112, and XVII to XXIV, June, 1876, price 1s. Contents: Physical structure of the London Basin in relation to the Geology of Watford by Professor J. Morris.—Chalybeate Spring at Watford and Medicinal Waters in Herts, by R. A. Pryor—Rainfall in 1875—Proceedings of the Club.

Watson (Rev. J. S.) The Reasoning Power in Animals, small 8vo, *cloth boards* 1867, 8s 6d (pub. 10s 6d.)

Wernerian Natural History Society Memoirs, from the Institution of the Society, in 1808 to 1837, illustrated by numerous maps and plates, many of them coloured, 7 volumes 8vo, *half calf, neat*, Edinburgh, 1811-38, £2 2s.

White (Gilbert) Natural History and Antiquities of Selborne, with Notes by Frank Buckland and a Chapter on Antiquities by Lord Selborne, numerous illustrations by Delamotte, 2 volumes, 4to, large paper, with 300 additional photographic illustrations, *half bound morocco* 1876, £3 10s.

White (Gilbert) Natural History and Antiquities of Selborne, New and Beautifully Illustrated Edition, with Notes and Memoir, by Frank Buckland, a Chapter on Antiquities by Lord Selborne, containing 130 fine illustrations by Delamotte, 8vo, *cloth extra, gilt top*, 1876, 25s.

White (J.) Journal of a Voyage to New South Wales, with an Account of the Natural Productions of the Colony, 65 plates of Natural History, royal 4to, *half russia*, a very neat copy 1790, 12s 6d.

Wilson (Daniel) Prehistoric Man, Researches into the Origin of Civilization in the Old and New World, 3rd edition, revised and enlarged, with illustrations, 2 volumes, 8vo, pp. 820, 1876, 36s.

Wilson (Rev. E., M.A., F.L.S.) The Naturalist's Poetical Companion, with notes, 57 illustrations by W. H. Prior, second edition, post 8vo, *cloth*, 1846, 3s.

Wilson (J.) Illustrations of Zoology, 35 fine large and beautifully coloured plates of New Rare, or Remarkable Subjects of the Animal Kingdom, with Descriptions, imperial 4to, *half morocco, extra gilt leaves*, 1831, £2 10s (pub. £7.)

Wise (J. R.) The New Forest, and the whole district between Southampton Water, and the Avon: its History, Scenery, &c., illustrated with 63 exquisite etchings by Linton, royal 8vo, cloth gilt, 9s 6d (pub. £1 1s.)

WANTED, a Copy of No. I. of this Periodical. Address, stating price and condition, Professor NEWTON, Magdalene College, Cambridge.

TO ENTOMOLOGISTS.

THE best Specimens of BRITISH LEPIDOPTERA obtainable are supplied by W. H. HARWOOD, 8 West Stockwell Street, Colchester, who has also for disposal the largest assortment of LARVA and PUPÆ in the Kingdom.

Price List post-free on application.

Price Fourpence per Month, or Four Shillings per Annum, post free.

THE NATURALIST:

Journal of the West Riding Consolidated Naturalists' Society,

AND

GENERAL FIELD CLUB RECORD.

NEW SERIES.

Edited by CHAS. P. HOBKIRK & GEO. T. PORRITT, F.L.S.

Containing Original Articles, Notes, Reports of Societies, Correspondence, Exchange, &c.

HUDDERSFIELD: B. BROWN.

On the 1st of every Month, 32 pp. 8vo., with at least one Plate,

THE JOURNAL OF BOTANY—British and Foreign.

Edited by HENRY TRIMEN, M.B., F.L.S., British Museum, assisted by S. LE M. MOORE, F.L.S., Royal Herbarium, Kew.

Subscriptions for 1876 (12s, post free, in the United Kingdom) payable in advance to the Publishers, Messrs. RANKEN & Co., Drury House, St. Mary-le-Strand, London, W.C., of whom may be obtained the volume for 1875 (price 16s 6d, bound in cloth); also covers for the volume (price 1s) and back numbers.

THE QUARTERLY JOURNAL OF CONCHOLOGY.

This Journal circulates widely amongst Conchologists throughout the world, and contains every quarter articles dealing with all departments of the Science.

Price 1s. per number, or 4s. 4d. per Annum, Post-free.

Edited by JOHN W. TAYLOR, St. Ann's Printing Works, Leeds,

To whom all Post Office Orders should be made payable, and all communications addressed.

London: HARDWICKE & BOGUE, 192 Piccadilly.

REVUE ET MAGASIN DE ZOOLOGIE

PARAIT UNE LIVRAISON CHAQUE MOIS.

et forme chaque année un fort volume in 8vo. de 500 pages et 30 planches environ.

23 francs par an (£0 18s 6d, post free).

Ce recueil fondé en 1831 par M. Guerin Meneville est toujours sous la direction scientifique de ce célèbre auteur. Il contient un grand nombre de travaux inédits sur toutes les branches de la zoologie, et des comptes-rendus des ouvrages nouveaux ayant trait à cette science.

Les abonnements pour l'Angleterre doivent être adressé à Mr. Boucard, 55 Great Russell Street, W.C., London; pour les autres pays, chez Deyrolle fils, 23 rue de la Monnaie, Paris.

THE CANADIAN ENTOMOLOGIST:

A MONTHLY PUBLICATION ON INSECTS, ISSUED BY THE ENTOMOLOGICAL SOCIETY OF CANADA.

Subscription: Five Shillings stg. for volume of 12 numbers, free of postage.

Address—Rev. C. J. S. BETHUNE, Trinity College School, Port Hope, Ontario, Canada.

On the 1st of every month. Price Sixpence. 32pp. 8vo.

THE ENTOMOLOGIST'S MONTHLY MAGAZINE,

Conducted by J. W. DOUGLAS, R. MCLACHLAN, F.L.S., F. C. RYE, and H. T. STAINTON, F.R.S., &c.

This Magazine was commenced in 1864, and its pages are principally devoted to information respecting British Entomology.

London: JOHN VAN VOORST, 1 Paternoster Row, E.C.

N.B.—The volumes commence with the June number in each year. Subscriptions (10s. per ann., post free), should be forwarded to the Editors, at the above address.

No. XXVII. JULY, 1877. Vol. IV.

"Time's glory is
To unmask falsehood and bring truth to light."

THE SCOTTISH NATURALIST

Edited by F. Buchanan White, M.D., F.L.S.

CONTENTS.

	Page
Zoology—	
On Migration,—Colonel Drummond Hay, C.M.Z.S.,	85
The Lepidoptera of Moncreiffe Hill *(Continued)*,—Sir T. Moncreiffe, Bart.,	90
Some Notes on the British Species of Oporabia *(Illustrated)*,—F Buchanan White, M.D., F.L.S.,	111
Waste of Life at St. Abb's Head,—J. H. Gurney, jun., F.Z.S.,	110
The Extermination of Rare Birds,—Rev. W. Herdman,	116
Capture of Vanessa Antiopa,—Dr. Buchanan White,	116
Colias Edusa in Galloway,—W. D. Robinson-Douglas, B.A., F.L.S., F.R.G.S.,	117
,, ,, Dumfriesshire,—R. Service,	117
,, ,, Berwickshire,—W. Shaw,	117
,, ,, Perthshire,—W. Herd,	117
Alternation of Generation in Cynipidæ,—Editor,	117
Phytology—	
Notes on Abnormal Plants,—Professor R. H. Paterson,	118
Notes on Lathræa squamaria,—Id.,	119
Rare Plants from Ben Lomond,—Id.,	119
Alchemilla conjuncta Bab.—(Extracted),	119
Cryptogamic Society of Scotland,	119
Insecta Scotica—	
The Lepidoptera of Scotland,—F. Buchanan White, M.D., F.L.S.,	120
The Coleoptera of Scotland,—D. Sharp, M.B.,	129

PERTH:
Perthshire Society of Natural Science.
Edinburgh: MacLachlan & Stewart, South Bridge.
London: E. W. Janson, 28 Museum Street, W.C.
Paris: E. Deyrolle, 23 Rue de la Monnaie.

SAMUEL COWAN AND CO., STRATHMORE PRINTING WORKS, PERTH.

BOOKS FOR SALE.

NEWMAN'S ZOOLOGIST, 1843-1876, in 33 Volumes. Price, £15.

ENTOMOLOGISTS' MONTHLY MAGAZINE, 12 Vols., 1864-76. Price, £4, 10s.

ENTOMOLOGISTS' ANNUALS, 21 Volumes (all published), 1855-75. Price, £2.

Apply to X. Y., care of Editor of *Sc. Nat.*

NOTICE.

Subscriptions to the "Scottish Naturalist" 4s. per annum, post free, payable in advance. Single numbers, 1s. 2d. Annual Subscription not paid in advance, not including postage, 4s. 6d. Stamps cannot be received in payment, nor are receipts sent unless a Post Card or stamped Envelope is forwarded.

Subscriptions to be paid to Mr. John Young, C.E., Tay Street, Perth.

Communications intended for the October number must be sent to the Editor (Dr. Buchanan White, Perth), not later than 1st September.

WANTED, a Copy of No. I. of this Periodical. Address, stating price and condition, Professor NEWTON, Magdalene College, Cambridge.

TO ENTOMOLOGISTS.

THE best Specimens of BRITISH LEPIDOPTERA obtainable are supplied by W. H. HARWOOD, 8 West Stockwell Street, Colchester, who has also for disposal the largest assortment of LARVÆ and PUPÆ in the Kingdom.

Price List post free on application.

Price Fourpence per Month, or Four Shillings per Annum, post free.

THE NATURALIST:

Journal of the West Riding Consolidated Naturalists' Society,

AND

GENERAL FIELD CLUB RECORD.

NEW SERIES.

Edited by CHAS. P. HOBKIRK & GEO. T. PORRITT, F.L.S.

Containing Original Articles, Notes, Reports of Societies, Correspondence, Exchange, &c.

HUDDERSFIELD: B. BROWN.

On the 1st of every Month, 32 pp. 8vo., with at least one Plate,

THE JOURNAL OF BOTANY—British and Foreign.

Edited by HENRY TRIMEN, M.B., F.L.S., British Museum, assisted by S. LE M. MOORE, F.L.S., Royal Herbarium, Kew.

Subscriptions for 1876 (12s. post free, in the United Kingdom) payable in advance to the Publishers, Messrs. RANKEN & Co., Drury House, St. Mary-le-Strand, London, W.C., of whom may be obtained the volume for 1875 (price 10s. 6d. bound in cloth); also covers for the volume (price 1s) and back numbers.

THE QUARTERLY JOURNAL OF CONCHOLOGY.

This Journal circulates widely amongst Conchologists throughout the world, and contains every quarter articles dealing with all departments of the Science.

Price 1s. per number, or 4s. 4d. per Annum, Post-free.

Edited by JOHN W. TAYLOR. St. Ann's Printing Works, Leeds,

To whom all Post Office Orders should be made payable, and all communications addressed.

London: HARDWICKE & BOGUE, 192 Piccadilly.

REVUE ET MAGASIN DE ZOOLOGIE

PARAIT UNE LIVRAISON CHAQUE MOIS,

et forme chaque année un fort volume in 8vo. de 500 pages et 30 planches environ.

23 francs par an (£0 18s 6d, post free).

Ce recueil fondé en 1831 par M. Guerin Meneville est toujours sous la direction scientifique de ce célèbre auteur. Il contient un grand nombre de travaux inédits sur toutes les branches de la zoologie, et des comptes-rendus des ouvrages nouveaux ayant trait à cette science.

Les abonnements pour l'Angleterre doivent être adressé à Mr. Boucard, 55 Great Russell Street, W.C., London; pour les autres pays, chez Deyrolle fils, 23 rue de la Monnaie, Paris.

THE CANADIAN ENTOMOLOGIST:

A MONTHLY PUBLICATION ON INSECTS, ISSUED BY THE ENTOMOLOGICAL SOCIETY OF CANADA.

Subscription: Five Shillings stg. for volume of 12 numbers, free of postage.
Address Rev. C. J. S. BETHUNE, Trinity College School, Port Hope, Ontario, Canada.

On the 1st of every month, Price Sixpence, 24 pp. 8vo.,

THE ENTOMOLOGIST'S MONTHLY MAGAZINE,

Conducted by J. W. DOUGLAS, R. MCLACHLAN, F.R.S., F.L.S.; F. C. RYE, and H. T. STAINTON, F.R.S., &c.

This Magazine was commenced in 1864, and its pages are principally devoted to information respecting British Entomology.

London: JOHN VAN VOORST, 1 Paternoster Row, E.C.

N.B.—The volumes commence with the June number in each year. Subscriptions 6os per vol., post free, should be forwarded to the Editors, at the above address.

No. XXVIII. OCTOBER, 1877 Vol. IV.

"*Tiru's glory is*
To unmask f[illegible]"

THE SCOTTISH NATURALIST

Edited by F. Buchanan White, M.D., F.L.S.

CONTENTS.

	Page
Zoology—	
On Migration (*Continued*).—Colonel DRUMMOND HAY, C.M.Z.S.,	133
The Lepidoptera of Moncreiffe Hill (*Continued*),—Sir T. MONCREIFFE, Bart.,	144
Does Alternation of Generations or Dimorphism occur in the European Cynipidæ?—P. CAMERON,	152
Further Notes on the Species of Oporabia,—Dr. F. BUCHANAN WHITE, M.D., F.L.S.,	158
Colias Edusa in Orkney—W. TAIT,	160
,, ,, South-West of Scotland,—W. D. ROBINSON-DOUGLAS, B.A., F.L.S., F.R.G.S.,	160
Mustela Erminea,—JAMES M'ANDREW,	160
Note on the Zoology and Botany of Glen Tilt,—EDITOR,	160
Phytology—	
Descriptions of New Lichens,—JAMES STIRTON, M.D., F.L.S.,	164
Scottish Galls,—Professor TRAIL, M.A., M.B., F.L.S.,	168
Berteroa incana.—Rev. W. HERDMAN,	170
Bog-Mosses,—JOHN SIM,	170
Insecta Scotica—	
The Lepidoptera of Scotland,—F. BUCHANAN WHITE, M.D., F.L.S.,	173
The Coleoptera of Scotland,—D. SHARP, M.P.,	176

PERTH:
PERTHSHIRE SOCIETY OF NATURAL SCIENCE.
EDINBURGH: MACLACHLAN & STEWART, SOUTH BRIDGE.
LONDON: E. W. JANSON, 28 MUSEUM STREET, W.C.
PARIS: E. DEYROLLE, 23 RUE DE LA MONNAIE.

SAMUEL COWAN AND CO., STRATHMORE PRINTING WORKS, PERTH.

BOOKS FOR SALE.

NEWMAN'S ZOOLOGIST, 1843-1876, in 33 Volumes. Price, £1 5.

ENTOMOLOGISTS' MONTHLY MAGAZINE, 12 Vols., 1864-76. Price, £4, 10s.

ENTOMOLOGISTS' ANNUALS, 21 Volumes (all published). 1855-75. Price, £2.

Apply to X. Y., care of Editor of *Sc. Nat.*

NOTICE.

Subscriptions to the "Scottish Naturalist" 4s. per annum, post free, payable in advance. Single numbers, 1s. 2d. Annual Subscription not paid in advance, not including postage, 4s. 6d. Stamps cannot be received in payment, nor are receipts sent unless a Post Card or stamped Envelope is forwarded.

Subscriptions to be paid to Mr. John Young, C.E., Tay Street, Perth.

Communications intended for the January number must be sent to the Editor (Dr. Buchanan White, Perth), not later than 1st December.

The Subscription for 1877 having now expired, that for 1878 should be paid before January 31, that Subscribers may receive their copies without any delay.

Price Fourpence per Month, or Four Shillings per Annum, post free.

THE NATURALIST:

Journal of the West Riding Consolidated Naturalists' Society,

AND

GENERAL FIELD CLUB RECORD.

NEW SERIES.

Edited by CHAS. P. HOBKIRK & GEO. T. PORRITT, F.L.S.

Containing Original Articles, Notes, Reports of Societies, Correspondence, Exchange, &c.

HUDDERSFIELD: B. BROWN.

On the 1st of every Month, 32 pp. 8vo., with at least one Plate.

THE JOURNAL OF BOTANY—British and Foreign.

Edited by HENRY TRIMEN, M.B., F.L.S., British Museum, assisted by S. LE M. MOORE, F.L.S., Royal Herbarium, Kew.

Subscriptions for 1876 (12s. post free, in the United Kingdom) payable in advance to the Publishers, Messrs. RANKEN & Co., Drury House, St. Mary-le-Strand, London, W.C., of whom may be obtained the volume for 1875 (price 10s 6d, bound in cloth); also covers for the volume (price 1s) and back numbers.

On the 1st of every month, Price Sixpence, 24 pp. 8vo.,

THE ENTOMOLOGIST'S MONTHLY MAGAZINE,

Conducted by J. W. DOUGLAS, R. M'LACHLAN, F.R.S., F.L.S.; E. C. RYE, and H. T. STAINTON, F.R.S., &c.

This Magazine was commenced in 1864, and its pages are principally devoted to information respecting British Entomology.

London: JOHN VAN VOORST, 1 Paternoster Row, E.C.

N.B.—The volumes commence with the June number in each year. Subscriptions (6s per vol., post free), should be forwarded to the Editors, at the above address.

CRYPTOGAMIC SOCIETY OF SCOTLAND,

THIRD ANNUAL CONFERENCE,

DUNKELD, OCT. 16th to 19th.

Oct. 16. Meeting of Council and Excursion in Afternoon.
Oct. 17. Excursion—Business Meeting and Conversazione.
Oct. 18. Excursion—Conversazione in Evening.
Oct 19. Fungus Show.

For further information apply to the Secretary, Dr. BUCHANAN WHITE, F.L.S., Perth.

THE QUARTERLY JOURNAL OF CONCHOLOGY.

This Journal circulates widely amongst Conchologists throughout the world, and contains every quarter articles dealing with all departments of the Science.

Price 1s. per number, or 4s. 4d. per Annum, Post-free.

Edited by JOHN W. TAYLOR, St. Ann's Printing Works, Leeds,

To whom all Post Office Orders should be made payable, and all communications addressed.

London: HARDWICKE & BOGUE, 192 Piccadilly.

REVUE ET MAGASIN DE ZOOLOGIE

PARAIT UNE LIVRAISON CHAQUE MOIS.

A forme chacun année un fort volume in 8vo. de 500 pages et 30 planches environ,

23 francs par an (£c 18s 6d. post free).

Ce recueil fondé en 1831 par M. Guerin Meneville est toujours sous la direction scientifique de ce célèbre auteur. Il contient un grand nombre de travaux inédits sur toute la branche de la zoologie, et des comptes rendus des ouvrages nouveaux qui paraissent en France.

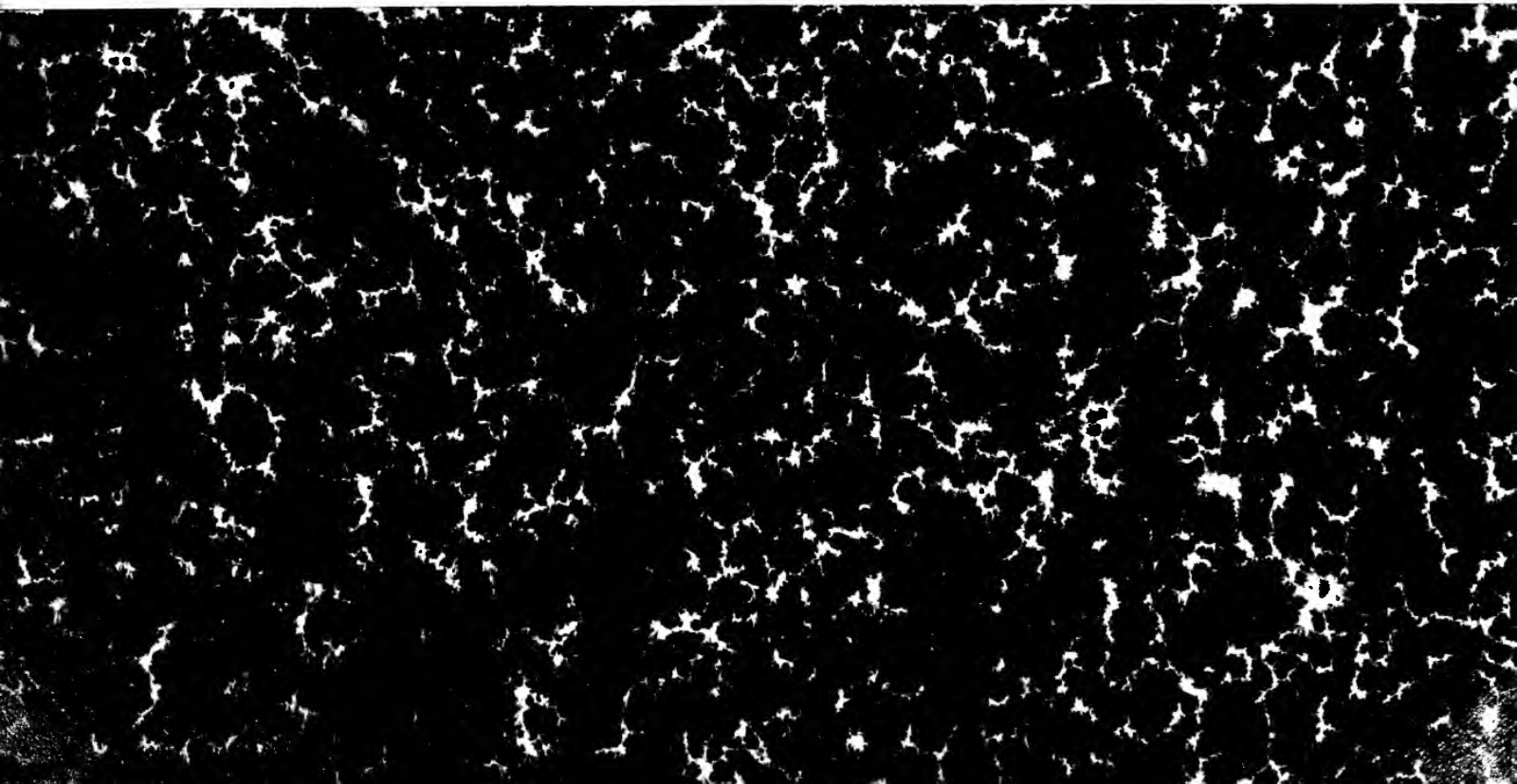
Les abonnements pour l'Angleterre doivent être adressés à Mr. Boucard, 55 Great Russell Street, W.C., London; pour les autres pays, chez Deyrolle fils, 23 rue de la Monnaie, Paris.

THE CANADIAN ENTOMOLOGIST:

A MONTHLY PUBLICATION ON INSECTS, ISSUED BY THE ENTOMOLOGICAL SOCIETY OF CANADA.

Subscription, Five Shillings sterling, for volume of 12 numbers, free of postage.

Address—Rev. C. J. S. BETHUNE, Trinity College School, Port Hope, Ont. Co., Canada.

MBL WHOI LIBRARY
WH 18TQ R

J. HOLZER
BINDER
BOSTON, MASS.